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contents

Research—A Major Industry 35

Materials in Airframe Construction
H. H. Grover and S. A. Gordon 36

Industrial Use of Sound . *Boyd A. Wise, Jr.* 40

Battelle Technical Review—Abstracts 209a

Notes From Battelle 43

Recent Papers by the Research Staff 45

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Research--a Major Industry

It has been customary to think of research as a supplement to industry. While research is just that —a vital feature of every modern industry—it also plays an additional role in our economic system. It is an industry in itself, one that creates jobs, buys industrial products, and contributes to the operation of the economy.

Research, today, employs some 300 thousand people. It does an annual "business" of over two-and-a-half billion dollars. Invested in scientific equipment and research laboratories is a capital outlay of perhaps four billion dollars. By American industrial standards, operations of such magnitude represent a major business.

Sums spent on research—like sums spent in every other creative phase of American industry—have a stimulating effect upon our economy. Businesses other than those that support research profit from it. The two-and-a-half billion dollars spent annually on research initiates a chain reaction that benefits practically all business and all trades and professions.

The "research industry" is a relatively new major industry. In 1940, private industry was spending only about 200 million dollars a year on research. Government research, except for agriculture, was still a relatively small operation, the total amounting to only 50 million a year. Prior to World War I, there was little research as we know it today. Inventions, before that time, usually came from the "woodshed." Invention and its application was a matter of "inspiration," followed by "cut and try." That type of research—while the sole basis for the technological advances made —did not make a striking impact upon the economy because its use was gradual and the time lapse between the discovery and its application was long.

Research became a significant economic factor when it became organized. It had little chance for growth as long as it was based upon inspiration. When the integrated laboratory came into being, research became as systematic as a planned sales or production campaign. It became highly organized, carefully planned, and expertly executed. Because of this, it became efficient—and with efficiency came the phenomenal growth seen in the past ten or twelve years.

Since organized research is so recent—so young, there is every reason to believe that the growth pattern established will continue. Research will become a still bigger "business," and will play an increasingly great role in the dynamics of our economy.

Clyde Williams

Director, Battelle Memorial Institute

Materials in Airframe Construction

by H. H. GROVER AND S. A. GORDON

Dr. Grover has been engaged in studies of the engineering properties of metals since joining the Battelle staff in 1942. Much of his research on fatigue properties has been done under the sponsorship of the National Advisory Committee for Aeronautics and the aircraft industry. Samuel Gordon, who just recently became affiliated with Battelle, has long been closely associated with the aircraft industry. He has specialized in structural design and research and was in charge of structural testing for the Glenn L. Martin Company from 1940 to 1950.

IN THE early "stick and wire" days of aircraft development (1903-1918), the primary objective of the designer was to get his airplane off the ground. Little was known about aerodynamic and structural requirements, and much emphasis was put on a simple tensile-strength/weight ratio. Moreover, pioneer designers were often neither metallurgists nor engineers and chose materials entirely from those commonly available for other products (including the piano). Wood was favored as a basic structural material because of its availability and ease of fabrication. Fabrics to cover airfoil, or wing, surfaces were undoubtedly suggested by their use in lighter-than-air ships. Plain carbon steels were used for fittings and piano wires for trussing. Such materials produced heavier-than-air machines which flew and secured experience for designers and experience for pilots.

During and following World War I, the age of "stick and wire" gradually changed to one of steel tubes and wire and experimental use of aluminum alloys. Designers developed some consideration for hollow tubing to provide lightness, strength, and suitable rigidity. Manufacturing processes for metals became more reliable. The German discovery of duralumin, and use of this in Zeppelins, gave impetus to consideration of light-metal alloys. In 1923, the Aeromarine Plane & Motor Company developed an "all-metal" airplane whose tail surfaces were of fabric-covered aluminum alloy. Charles Ward Hall contributed much to design for use of aluminum and built, in 1927, an all-metal airplane known as the XPH-1. In 1929, the Consolidated Aircraft Corporation built the "Commodore," an all-metal flying boat whose major lift strut fittings were aluminum alloy castings. This flying boat remained in commercial service for over ten years. Despite such developments, all-wood airplanes remained popular; the all-wood Consolidated "Fleetster" was considered modern design in 1930.

In the period 1930-1942, the all-metal airplane came into its own. Possibly the greatest single cause for the transition was the increase in speed of aircraft. Smooth contour could not be maintained by fabric covering nor could such covering resist the high-pressure differential imposed on the airfoil. In 1925, General, then Lieutenant, James H. Doolittle won the Schneider Cup race at 232 miles per hour in a wood-and-fabric Curtiss Army seaplane. Captain George E. Price dove the all-metal Bell Aerocobra over 600 miles per hour in 1940.

During the same period, there was also great development in metals and fabrication of metals. High-strength aluminum alloys, such as 17S-T and 24S-T, were used with great success. Alloy steels, such as SAE 4130 and SAE 4340, became popular for fittings and landing gear. Stainless steels were tried, although relatively unsuccessfully, in airframes. With increased experience, sometimes gained at the expense of hazardous flight tests, design rules developed to take account of other material properties (such as elastic modulus, compressive and tensile yield, corrosion resistance, and other factors) in addition to the early consideration of tensile-strength/weight ratio.

World War II Developments

The advent of World War II brought on an accelerated program of real research on airframe materials. In 1942, aircraft companies experimented with prestretching and aging aluminum alloy 24S-T to obtain increases as high as 112 per cent in ultimate tensile strength and 160 per cent in tensile yield strength. Development of 75S-T aluminum alloy and of methods of fabrication of this alloy gave further possibilities. The Northrop "Flying Wing," completed in 1946, was one of the first airplanes basically designed around this alloy.

Many additional material properties became of real concern as designers strove for still higher speeds and lower design factors to increase pay-load capacities.

Attempts to use certain magnesium alloys and the 75S-T aluminum alloy brought forth consideration of stress-corrosion cracking. Use of these materials in heavy transports made the property of resistance to fatigue failure a matter of concern. To date, many problems have been solved by increasing knowledge of material properties and design needs. It is not uncommon to find in the airframe of large airplanes, such as the B-36, several alloy steels, 24S-T and 75S-T aluminum alloys, a magnesium wrought alloy, and several casting alloys—each used with regard for particular properties suitable to its part in the structure.

The search for new materials continues. Improvements in both ferrous and light-metal alloys are being made. Completely new materials, such as titanium- and zirconium-base alloys are also being developed. Aircraft requirements have not only influenced the development of metals but have also reached into such materials as glass, plastics, and rubber. The present "unbreakable" glass tumbler is a commercial development resulting from strength requirements for pressurized cabins. Attachment of Plexiglas to metal structures presents new problems. Silicone rubbers are used to meet low-temperature gasket requirements, and such materials as neoprene are of interest for wing fuel cells.

Rating Materials for Aircraft

The table lists a few of the different materials currently in use in airframe construction and shows approximate values of some strength properties of each. There has been no attempt to make this table comprehensive. The table is intended merely to illustrate the extent of differences in properties of materials that have been found useful.

Some of the properties listed in the table indicate the complexities involved in rating materials for use in aircraft. A glance at the entries shows that the ratio of ultimate tensile strength to weight does not extend over a very wide range (although it must be admitted that this range could be appreciably extended by adding other materials); on this basis, there is no critical choice. However, it has long been realized that no optimum design can be derived by the oversimplified concept of an airframe as a rigid body built of brittle material considered only in tension. Not only are compressive stresses fully as important as tensile stresses, but also the limitation of *yielding* (by buckling or otherwise) is even more critical than the limitations dictated by tensile or shear fracture. Modern airframes are rather complex and invariably redundant in nature, so that the design must consider strain as well as stress, thus making the *modulus of elasticity* an important factor. A large airframe of low-load factor, which is expected to have a high utility value, is subject to another contingency: failure by *fatigue;* in such cases, the fatigue endurance limit, fatigue notch sensitivity, and similar properties need consideration. There are many other properties of materials not listed in the table which are not necessarily less critical when associated with specific environments. Some of these are creep, corrosion resistance, and high- and low-temperature prop-

Material	Density, pounds per cu. in.	Modulus of Elasticity, psi	Ultimate Tensile Strength, psi	Yield Strength, psi	Endurance Limit, psi	Other Important Characteristics	Application
Steel							
SAE 4130	0.28	30×10^6	180,000	145,000	90,000	Easily forged, machined, welded, etc.; poor ductility at very high strengths.	Landing gears; highly stressed fittings.
SAE 4130	0.28	30×10^6	98,000	63,000	51,000		
Stainless Steel							
AISI-302	0.28	30×10^6	185,000	140,000	71,000	Good at elevated temperatures; good corrosion resistance.	Firewalls; structural parts affected by high temperature.
Magnesium							
AZ80X	0.065	6×10^6	50,000	34,000	17,000	Fatigue notch sensitive; corrodes very easily.	Low-stressed surfaces; low-stressed fittings and extrusions.
AZ31X	0.065	6×10^6	42,000	30,000	16,000		
Aluminum							
24S-T3	0.101	10×10^6	76,000	66,000	20,000	Good corrosion resistance; poor at moderately high temperatures.	Complete airframes structure.
75S-T6	0.101	10×10^6	82,000	72,000	21,000		
Titanium	0.16	14×10^6	125,000	.....	.....	Very costly; poor creep characteristics at or near yield loads.	Firewalls; structural parts affected by high temperature.
Glass Fabric Base Polyester Laminates	0.068	3.5×10^6	57,000	34,000	.....		Wing tips, heating ducts, etc.
Polymethyl Methacrylate	0.04	0.5×10^6	8,900†	6,300	.....		Canopies and other glazing purposes.
Glass (Plate)	0.09	10×10^6	9,000†	.....	.....		Windshields.
Sitka Spruce	0.015	1.3×10^6	10,000†	.....	.....	Strongly anisotropic.	Complete airplane or nonstructural parts in metal airplanes.

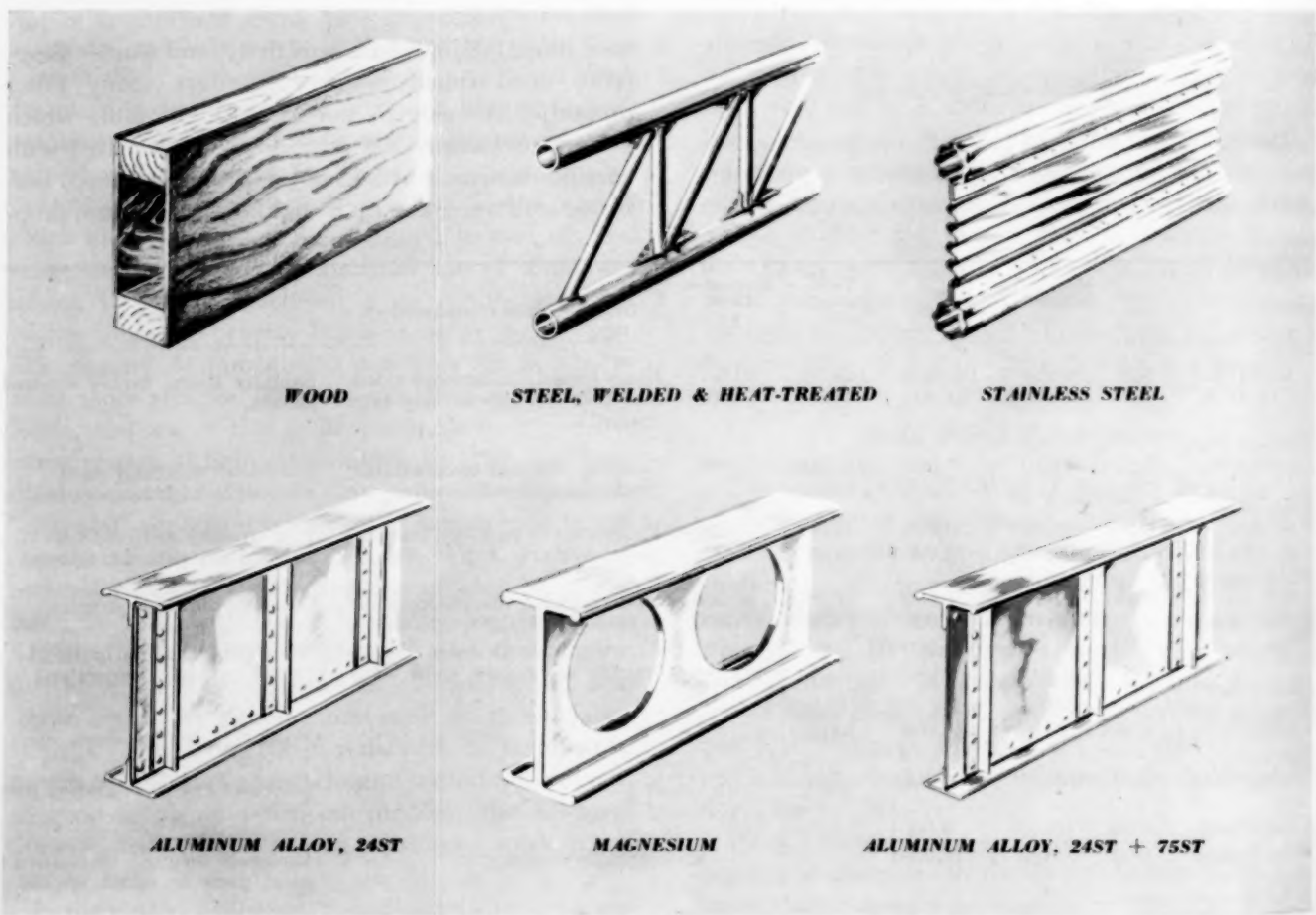
†Modulus of rupture.

erties. In fact, the strength/weight ratio method of comparing materials often proves the least important factor when materials are evaluated for a proposed design.

A simple example illustrating the relationship of material properties to a design configuration is shown in the illustration. A beam can be made of any one of the available materials normally used for a structure designated to carry a load. The resultant beam depth might be equally usable if the beam is made of any one of the illustrated materials or of properly selected composite materials, provided that consideration is taken in the design for the best properties of that material or materials. The wood beam must avoid thin members for shear and requires bulk to distribute the load; in this case, all of the materia[1] is working in bending (including the web), and adequate area is available for shear transmission through the bond. The steel beam can be made of very high-strength steel and relatively thin-walled tubes to serve for the chords. Shear can be transmitted through short columns, which form a truss, so that the high modulus and strength are fully utilized. A stainless steel beam might be made of very thin sheet, so shaped as to have high buckling values, to fully utilize the compression yield strength. The shear can be transferred through a "wandering" web, and spot welding can be used to minimize the joining problems. An aluminum alloy beam requires more bulk than steel, because of the lower ultimate strength, but the reduced modulus of elasticity requires careful control of free edges to prevent buckling at low stresses. Shear is transferred through stiffened thin sheet webs by a combination of shear and tension. A magnesium beam requires even more bulk than the aluminum beam, but can be designed to maintain complete stability under load. A composite aluminum beam might take advantage of the high yield stress of 75S-T by reducing the web thickness and the area of the compression chord.

Applications of Materials

It is interesting to note that as the aircraft industry became interested in each new material the development of a complete airframe of that material resulted with a reasonable degree of success in each case. At



least two airplanes, one a cargo-type and the other a small amphibian, have been constructed of all-stainless steel, spot welded. The undesirable properties of the material were minimized by careful design, by using formed shapes for compression and thin sheet in tension.

Magnesium has been exploited to the extent that complete wings have been fabricated from it despite some of its objectionable qualities. A small two-place airplane with an all-magnesium fuselage was built and flown in 1936.

The most common materials used at the present time are, of course, the high-strength aluminum alloys (24S-T, 14S-T, and 75S-T) which appear to be the most versatile materials available to the airframe designer today. This versatility makes them adaptable to semimonocoque and full-monocoque types of construction. Designs employing them can be developed to give a high degree of efficiency in present airplanes of most speeds and gross weights.

In the search for new materials, old and well-known ones are again being considered. For example, wood was used structurally in the earliest airplanes. Later this was abandoned to a large extent. But, design knowledge gained through the use of the newer materials has made it possible to reconsider wood as a material for basic structures. A full-monocoque design in a large airplane, such as the Hughes "Flying Boat", which allows sufficient space for such a low-strength material, now becomes perfectly feasible. Even smaller low-load factor airplanes have been successfully built in which the wood components were molded over steel dies and bonded under heat and pressure, giving full-monocoque characteristics. Durable finishes made the structure almost impervious.

Steel, because of its weight, has seldom been used as a main structural material in aircraft. But, in combination with aluminum, it shows some striking possibilities. For example, a twin-engine commercial airplane, which has been built in large quantities, has an all-aluminum wing covering, aluminum ribs, but integral steel tube main spars and engine mount.

Materials not yet fully developed commercially, that may have possibilities in aircraft, particularly in supersonic airplanes, are the titanium alloys. Their modulus of elasticity is 140 per cent greater than that of aluminum alloy and they are about 160 per cent heavier. Ultimate strengths almost twice that of the aluminum alloys can be attained. These characteristics in themselves are inviting. More inviting, however, is the fact that the titanium alloys have high corrosion resistance, reasonably good fatigue characteristics, and thermal resistance to withstand higher temperatures than aluminium without intolerable loss of strength. They can be worked in the same manner as ordinary steels. Full advantage of the strength cannot, however, be realized under constant load because of poor creep qualities. Their choice for structural components will, therefore, require careful scrutiny.

Conclusions

From this brief glance at the development of the use of materials in airframe construction, some general trends appear evident. In the early days, much attention was given to the strengthweight ratio and to availability and ease of fabrication. As aircraft structural design advanced, the importance of other properties became apparent, and practical methods of using many different types of material were developed. It appears that new materials, have not, in general, made previous ones obsolete; in fact, very few alloys have been entirely discarded as new ones were developed. The trend has been rather toward taking advantage of better properties of new metals and alloys for some parts, and retention of previous materials for other parts and components where the properties were valuable.

While prediction for the future is always hazardous, it is reasonable to project existing trends into the near future. As a new material—say, titanium alloy—is developed, it may be expected that this will be tried out extensively for airframe use. It is even possible that an essentially "all-titanium" airplane might be constructed and tested. On the basis of past records, this plane might prove successful. The lessons learned from such an adventure would quite possibly lead, not to abandoning present airframe materials, but rather to the use of the titanium alloy for some components and to wiser use of current alloys in other components.

Thus, it may be expected that improvements in metals and alloys will lead to improved design. In turn, improved design principles will not only bring better applications of both old and new materials, but in the future, as in the past, will propose new problems and demands for new materials with different properties.

Industrial Use of Sound

by Boyd A. Wise, Jr.

The author has worked extensively on the development of ultrasonic transducers and on industrial applications of ultrasonics, particularly in nondestructive testing. He joined the research staff at Battelle early in 1948 and is currently engaged in studies of new oil well drilling methods.

During World War II, use of high-frequency sound waves, or ultrasonics, was a key factor in the detection of enemy submarines. Since that time, we have learned more about how ultrasonics can be used, not only in attack on submarines, but also in attack on quite a few of the problems of industry. As we learn of more industrial processes that may benefit from the use of ultrasonic energy, and as lower cost equipment for producing it becomes available, the number and variety of industrial applications will increase.

"Silent" sound, as ultrasonic energy is often called, refers to sound waves with frequencies of vibration higher than the human ear can hear, or above about 16,000 cycles per second. Much is heard about research in this field, yet the sound we can hear may also be effective for industrial purposes. At Battelle, vibrations as low as 2,500 cycles per second have been found most efficient in some washing operations.

There is no magical line that determines the industrial usefulness of sound. Only research in each case can determine if high or low frequencies will be more efficient. The cost of sound as an energy source often varies with the frequencies used. Generally, the higher the number of cycles per second, the more the cost will be. This has encouraged research in the lower frequencies.

Sound and Matter

High-frequency sound waves may be directed in narrow or broad diffuse beams. As the energy passes through a given material, the effects vary according to the composition of the material and the frequency and power of vibrations. Stable mixtures can be produced from normally non-mixable liquids like oil and water, or mercury and water. Large solid particles may be reduced to dust. Small particles of liquids and solids can be removed from a gas stream by causing them to collect together. Many chemical reactions are speeded up in the presence of ultrasonic radiation. High-powered sound waves can be used to remove gas from most liquids. The production of heat by ultrasonics has been used in physical therapy, where effects differ from those obtained with X-rays, infrared, or diathermic methods. Ultrasonic vibrations can also kill bacteria.

It would be difficult to think of an industry that might not benefit from the use of high-frequency sound waves. Some present and potential applications include: inspecting materials for internal flaws removing water during soap making; causing smoke particles to drop out of exhaust gases before discharge from chimneys; drying paper during manufacture; speeding up the dyeing of fabrics and plastic materials; recovering fine metallic dust lost in smelting operations; removing dirt in laundering; aging liquor; sterilizing foods and processing leather and ceramic materials.

Nondestructive Testing

Perhaps the most widely accepted use of "silent" sound in industry has been in testing metals and metal products for hidden flaws that may lead to failure. A narrow beam of very high-frequency ultrasonic energy will penetrate some metallic materials with thicknesses up to 40 feet or more. Any flaws in the beam's path will reflect energy to the measuring instrument. Items tested include a wide variety of products, such as locomotive axles, rails, submarine hulls, gun barrels, turbine blades, bolts, and sheet and bar stock.

At Battelle, where an extensive laboratory for research in nondestructive testing is maintained, we find that this application of ultrasonic energy is playing an important part in reducing costs. Today, American industry is using nondestructive testing equipment to test and inspect billions of dollars worth of materials, parts, and assemblies. Used in the production process, as well as in preventive maintenance, nondestructive testing has also brought added safety to many phases of military and civilian life.

One of the newest applications of high-powered sound waves is as a tool for drilling and marking

hard or brittle material, like carbides, glass, and ceramics. These are almost impossible to work in any other way. Ultrasonics is also used very successfully in the cleaning of such manufactured parts as watches and electric shaver heads. The solvent, in which the parts are placed, is violently agitated. The resulting cleaning job is done better and faster than is possible with previous methods.

The high cost and low output of equipment for producing ultrasonic energy have been factors limiting its wider use by industry. This situation is changing, however, as a result of several outstanding developments of recent years.

Crystal Transducers

Through greater production by a number of companies, it has been possible to bring the price of some crystal transducers down from about $1000 to around $250. This type of equipment, probably the best known for generating ultrasonic waves, converts electrical energy into ultrasonic energy through the use of such crystals as quartz and Rochelle salt. These crystals are capable of changing electrical vibrations into mechanical vibrations and vice versa.

No more expensive than natural crystals is a new ceramic material, barium titanate, which is now being used for generating high-powered sound waves. This synthetic material can be formed into a variety of sizes and shapes that would be costly to make from natural crystals like quartz. The new ceramic also provides power substantial enough for practical use with voltages low enough for easy handling. Barium titanate equipment has proved especially useful in the production of ultrasonic waves in liquids. It may, therefore, find wide usage in the chemical processing industries.

The building blocks are here. It is now possible to investigate and properly evaluate the application of ultrasonic energy to industrial processes on a pilot-plant scale. On the "test-tube basis" of former years, this was not possible.

Ultrasonic energy has become recognized as a scientific tool useful to industry. Two important jobs, however, remain to be done. The first of these is to extend the number of industrial processes that can benefit from the use of ultrasonic energy. The second is to continue devising improved, higher-power generating equipment at lower cost, so that a greater range of applications can be made economically worth while.

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Science advances not by the accumulation of new facts—a process which may even conceivably retard scientific progress—but by the continuous development of new and fruitful concepts. —*James B. Conant.*

BATTELLE TECHNICAL REVIEW ABSTRACTS

SECTION INDEX

AGRICULTURAL RESEARCH 263a
Plant and animal nutrition; insecticides; fungicides; fertilizers; weed control; soils; etc.

ANALYSIS—CHEMICAL AND PHYSICAL 233a
Methods and apparatus for qualitative and quantitative determination of the composition of matter.

APPARATUS, METHODS, AND STANDARDS 237a
Industrial measurement, inspection, and control; laboratory equipment and procedures (except when auxiliary to other subjects); standards and specifications.

CERAMICS 247a
Abrasives; inorganic cements; glasses; ceramic coatings; structural clay products; refractories; whitewares.

CHEMICAL TECHNOLOGY 251a
Chemical engineering and process equipment; chemistry of materials such as wood, paper, textiles, and coal and petroleum by-products; petroleum refining.

CHEMISTRY—GENERAL, INORGANIC, AND PHYSICAL 254a

CHEMISTRY—ORGANIC 258a

CLEANING, FINISHING, AND COATINGS—METALLIC 220a
Buffing and polishing; chemical and electrochemical cleaning and coatings; diffusion, dip, oxide, sprayed, weld-deposited, and vapor-deposited coatings; cladding.

CORROSION 231a
Theory, measurement, and prevention (except by means of coatings).

DESIGN 250a
Design of parts, equipment, and structures (except when auxiliary to other subjects); theoretical stress analysis.

ELECTRICITY AND ELECTRONICS 270a
Electrical and electronic theory, circuits, equipment, and applications (except when auxiliary to other subjects).

FOUNDRY PRACTICE 213a
Melting; casting; pouring; rigging; shakeout and trimming; molding; core and pattern making; metallurgical control.

FUEL TECHNOLOGY 243a
Solid, liquid, and gaseous fuels—their properties and combustion; carbonization, liquefaction, and gasification of solid fuels; synthetic fuels. (For combustion in engines, see Section 21.)

GRAPHIC ARTS 273a
Printing and decorating processes, equipment, and materials; book manufacture; photography.

HEATING, DRYING, AND AIR CONDITIONING 245a
Space heating; cooling; humidification; materials drying and heating; equipment such as ovens, boilers, furnaces, heat pumps, and auxiliaries.

LUBRICATION AND FRICTION 250a
Lubricants and lubricating methods; friction fundamentals; nonmetallic bearing materials; oil filtration; lubricating-system design.

METALLOGRAPHY AND PRIMARY STRUCTURES 223a
Microscopy, diffraction methods and other techniques; phase diagrams; nuclear and crystal structures; microstructures; macrostructures. (For structures resulting from transformation or deformation see Sections 11 and 13, respectively.)

METALS—FABRICATION AND USES 242a
Miscellaneous fabrication procedures; applications of metals, alloys, and specific processes.

SECTION INDEX (Continued)

METALS—MECHANICAL PROPERTIES AND TESTS 228a
Elasticity and plasticity; stresses and stress analysis; fracture; creep; shear; hardness; fatigue; wear resistance; deformation structures.

METALS—PHYSICAL PROPERTIES AND TESTS 226a
Mass, thermal, thermodynamic, chemical, electrical, magnetic, and optical properties.

METALS—PRIMARY WORKING 214a
Preparation for working; forging; rolling; extrusion; swaging; tube making; wire and rod drawing; slitting, sawing, shearing, etc.

METALS—SECONDARY WORKING 215a
Drawing; impact extrusion; forming; stamping; machining and machinability; grinding; honing and lapping; strain hardening; shot peening; flame cutting.

METALS—SMELTING, REDUCTION, AND REFINING 210a
Smelting and reduction of ores; distillation of metals; electrolytic winning and refining; thermit processes; cementation; amalgamation; carbonyl, halide, and hydride processes; ingot practice.

METALS—THERMAL TREATMENT 219a
Homogenization; annealing; normalizing; patenting; quench, precipitation, and case hardening; tempering; stress relief; cold treatment; heating and cooling media. (For effects of thermal treatment, see Sections 11, 12, and 13.)

METALS—TRANSFORMATIONS AND RESULTING STRUCTURE 224a
Diffusion; nucleation and grain growth; recovery and recrystallization; allotropic transformations; precipitation; eutectoid reactions; other solid-state reactions; liquid-phase reactions; solid-liquid, vapor-solid, and vapor-liquid reactions.

METALS—WELDING OR JOINING 217a
Welding; soldering; brazing; weldability and weld tests; bonding metals to nonmetals; adhesive bonding; mechanical fastening.

MISCELLANEOUS 274a
Research and research organizations; general metallurgical articles; mathematics; medical research; patent law; other unclassified subjects.

ORE AND MATERIAL BENEFICIATION 209a
Preparation and concentration of solid materials; roasting; calcining; sintering; nodulizing; briquetting; mineralogy.

PAINTS, VARNISHES, LACQUERS, AND ENAMELS 263a
Organic and inorganic coatings (except ceramic coatings); their composition, properties, application, and testing.

PHYSICS 265a
Theory and practice (except as covered in other sections). Includes aerodynamics; biophysics; flow of gases and liquids; deformation of solids; heat transfer; nucleonics; semiconductivity and superconductivity; ultrasonics; etc.

PLASTICS AND HIGH POLYMERS 259a
Polymerization; properties; testing; processing methods and equipment; compounding. (Does not include rubbers and surface-coating resins.)

POLLUTION AND WASTES 243a
Sampling, analysis, collection, prevention, and treatment of gaseous and liquid wastes, including smoke, fumes, odors, fly ash, dusts, aerosols, sewage, and industrial wastes; by-product recovery; meteorological, topographical, and biological effects.

POWDER METALLURGY 217a
Powder production and properties; mixing; compacting; sintering; post-sintering operations.

PRIME MOVERS 246a
Reciprocating engines; turbines; jet engines; rockets; locomotives; auxiliary equipment; power from atomic fission.

RUBBERS AND OTHER ELASTOMERS 262a
Polymerization; properties; testing; processing methods and equipment; compounding.

STATISTICS AND ECONOMICS 273a
Natural resources; supplies; production and cost data; articles on economic trends.

BATTELLE TECHNICAL REVIEW

Volume 1, Number 4

ABSTRACTS†

April 1952

1. ORE AND MATERIAL BENEFICIATION

3789* Flotability of Various Grain Sizes Depending on the Consistency of the Flotation Suspension. (In Russian.) V. I. Klassen and R. Z. Erenburg. *Doklady Akademii Nauk SSSR*, new ser., v. 74, Aug. 11, 1951, p. 855-857.

The above was investigated over a considerable range of particle sizes and densities of the suspension. Data are discussed and charted.

3790* Coal Preparation Progress in Western Canada. H. Wilton-Clark. *Canadian Mining and Metallurgical Bulletin*. v. 45, Feb. 1952, p. 93-97; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 55, 1952, p. 79-83.

Discusses the wet washing characteristics of various coals and the relationship of specific gravity to ease of wet washing.

3791 The Cyclone as a Separating Tool; Its Use in Mineral Dressing. *Chemical Age*, v. 66, Feb. 16, 1952, p. 275-277. (Condensed from paper by K. A. Fern.)

Surveys principles of operations and variables which effect the process.

3792* Coal Preparation. Arthur Grounds. *Colliery Guardian* (Overseas Supplement), Winter 1951, p. 1-6.

Surveys developments of present practice in the above. Discusses factors which influence the degree of preparation required.

3793* Coal Screening Practice. J. F. Killeen. *Colliery Guardian* (Overseas Supplement), Winter 1951, p. 11-13.

Briefly discusses the abilities and limitations of some of the screens on the market. Describes factors to be considered in selecting screens for specific operations.

3794 Taconite Plants, New Processes Come First in Iron Ore Plans. L. A. Roe. *Engineering and Mining Journal*, v. 153, Feb. 1952, p. 125-127.

Discusses research and development programs for beneficiating iron ore by flotation, magnetic separation, gravity concentration, heavy-media separation, plus new ideas for metallurgical treatment of iron ores.

3795 Cyclones Set Pace In Milling. *Engineering and Mining Journal*, v. 153, Feb. 1952, p. 128-130.

Stresses usefulness of cyclone in desliming and other classification jobs. Presents a flowsheet illustrating use of cyclones for selective grinding. Cites other significant developments in milling and concentration of ores.

3796 In Nonferrous Metallurgy. A. W. Schlechten. *Engineering and Mining Journal*, v. 153, Feb. 1952, p. 131-133.

Discusses new leaching techniques for Ni and Co; a new electrothermic process for Zn recovery; and new production techniques for Ti.

3797* Economic Comparsion Between Tub Washing and Cyclone Washing. (In German.) *Erdöl und Kohle*, v. 5, Jan. 1952, p. 24-29.

Shows that the cyclone washer is more effective in the washing of fine coal and therefore more economical, because of the greater value of cyclone-washed coal. Includes graphs, tables, and diagrams.

3798 Experimental Furnace Recovers Manganese From Slag. R. C. Buehl. *Iron Age*, v. 169, Feb. 28, 1952, p. 97-99.

Tells how, from slag containing from 2.5-11.5% Mn, about 6 out of every 10 lb of this critical steel ingredient was recovered. The resulting Fe-Mn metal, 56-63% Mn, is suitable for production of ferromanganese. Iron yield may offset much of process' cost so that it can compete with foreign ores.

3799* Review of Cobalt Metal Production — Notes on Literature. John H. Dismant. *Mines Magazine*, v. 62, Jan. 1952, p. 21-23, 44.

Includes uses in the ceramic and metallurgical industries as well as processes for the recovery of Co from roasted pyrites.

3800* Mineral Dressing; Need to Approach Self Sufficiency Spurs Construction of New Plants and Research Toward Lower Cost Beneficiation. Nathaniel Arbiter. *Mining Congress Journal*, v. 38, Feb. 1952, p. 52-54.

3801* Modern Trends in Coal Preparation. Carel Robinson and Lee R. Smith. *Mining Congress Journal*, v. 38, Feb. 1952, p. 119-120, 127.

3802* Bagdad Expands Copper Mill—Recovers By-Product Molybdenite—Ups Copper Recovery by pH Control. *Mining World*, v. 14, Mar. 1952, p. 30-33.

Discusses the flotation practices for Cu at the Bagdad Copper Corp., Arizona. Mo recovery process is outlined. Flowsheet is given.

3803* Old King Coal Isn't Fiddling. *Utilization*, v. 6, Feb. 1952, p. 41-42.

Discusses new developments through coal research. Anthracite breaker slush, formerly discarded, is now being reclaimed and processed for utilization as special industrial fuel, and breaker silt is being reclaimed at the rate of 200,000 T. a year by new flotation-plant processes.

3804* Research on the Possibility of Using Float-and-Sink and Sedimentation Processes in the Beneficiation of Siegländer Siderite. (In German.) Hubert Gleichmann. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 5, Jan. 1952, p. 1-8.

Experimental results show that above process can be successfully applied when the grain sizes of siderite range from 100 to 0.25 mm. in diam. Includes diagrams, tables, and graphs.

Miscellaneous Publications

3805 Microstructure in Iron-Ore Pellets. Strathmore R. B. Cooke and T. E. Ban. University of Minnesota, "Twelfth Annual Mining Symposium, 1951, 26 pages. (TN5 M66p)

Presents results of a study of the microstructures occurring in the fired pellets produced in the laboratory and on a pilot-plant scale. Numerous micrographs. 11 ref.

†Prepared from books, journals, and other material received by the Battelle Memorial Institute Library.

1. *Ore and Material Beneficiation*

Book

3806 The Extraction of Non-Ferrous Metals. E. R. Roberts. 181 pages. 1950. Temple Press Limited, Bowling Green Lane, London, E. C. 1, England. (TN758 R54e)

Offers a brief discussion of the physicochemical principles underlying extraction processes, a general treatment of practical operations, and more detailed accounts of the extraction of the more important nonferrous metals.

See also:
3840 (ore operation—U.S. and Europe)
4424 (recovery of Se and Te from flue ducts)
4460 (mining and preparation of coal)
4594 (close-specific-gravity cyclone separation)

2. METALS—SMELTING, REDUCTION, AND REFINING

3807* The Fe-FeS-FeO System. (In Russian.) Ia. I. Ol'shanskii. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 21, 1951, p. 893-896.

A study was made of equilibria in the above system. The iron corner of the Fe-S-O diagram is illustrated. Data are discussed and tabulated.

3808* The Nature of Molten Iron Silicate and Solutions of FeS in It. (In Russian.) Ia. I. Ol'shanskii. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 1, 1951, p. 67-70.

The solubility of FeS in various mixtures of FeO, SiO_2, CaO, and MgO was studied experimentally. Data are discussed and charted.

3809* Composition of Blast-Furnace Gas and Efficiency of Blast Furnaces. (In German.) E. Schwarz-Bergkampf. *Berg- und Hüttenmännische Monatshefte der Montanistischen Hochschule in Leoben*, v. 97, Jan. 1952, p. 1-3.

Discusses briefly method of computing optimum charge of blast-furnace coke. Includes graphs.

3810 Present Variables Affecting Open Hearth Production in Pacific Coast Cold Metal Shops. George W. Teskey. *Blast Furnace and Steel Plant*, v. 40, Feb. 1952, p. 197-200.

Discusses the effect on openhearth production of the current quality and availability of materials used in making up the furnace charge in a basic cold-metal shop.

3811 Foundation Develops Process for Producing Articles of Steel. P. E. Cavanagh. *Blast Furnace and Steel Plant*, v. 40, Feb. 1952, p. 220-222.

Previously abstracted from *Iron Age*, v. 169, Jan. 24, 1952, p. 63-68; Jan. 31, 1952, p. 108-111, 114.

3812* Contemporary Status of the Theory of Metallurgical Processes in the Production of Steel in the U.S.S.R. (In Czech.) Ivo Petrman. *Hutnické Listy*, v. 6, Oct. 1951, p. 470-478; Nov. 1951, p. 538-541.

Outlines results of theoretical investigations in the field of steel production in the USSR and with investigations being conducted at the present time.

3813* Experiences of a Czechoslovakian Engineer in the USSR. (In Czech.) Arnost König. *Hutnické Listy*, v. 6, Nov. 1951, p. 544-546.

The author, who made a 3-month visit to the USSR, where he studied the production of copper in Soviet metallurgical plants, tells of his experiences.

3814* Phosphorus in Tin Plate in Soviet Practice. (In Czech.) Josef Teindl. *Hutnické Listy*, v. 6, Nov. 1951, p. 546-549.

In Soviet practice, it was found that a phosphorus content of 0.08-0.10% is the best for preventing sticking of sheets. It is necessary to melt phosphorus steel in an openhearth furnace with a basic slag in order to retain the special properties desired.

3815* Reduction of the Copper Content in Slags From Reverberatory Furnaces. (In Czech.) *Hutnické Listy*, v. 6, Nov. 1951, p. 552-554.

Analyzes the method developed in a certain Czech plant. This method is said to significantly lower the loss of Cu during smelting.

3816 Bottom Casting of Ingots for the Manufacture of Plates. T. T. Watson. *Industrial Heating*, v. 19, Feb. 1952, p. 265-266, 268, 270, 272, 274, 276, 280.

The general practice of bottom casting is reviewed, as well as metallurgical and pouring practice. The casting of rimmed steel and silicon-killed steel ingots is considered and tables of data for various ingot sizes show the rate of rise in inches per minute in the mold groups. Plate yield and quality of bottom-cast ingots are the final topics discussed. (To be continued.)

3817 Low-Carbon Ferro-Chrome-Silicon Cuts Stainless Ingot Costs. N. B. McFarlane. *Iron Age*, v. 169, Feb. 21, 1952, p. 108-110.

Discusses the above alloy produced in electric furnaces by carbon reduction from selected ores, and describes the production process. Gives advantages, stressing lower cost.

3818 Cupola Hot Metal Increases Steel Production, Cuts Ingot Costs. D. I. Brown. *Iron Age*, v. 169, Feb. 28, 1952, p. 104-107.

Describes practices of the Central Iron and Steel Div., Barium Corp., Harrisburg, Pa.

3819 Automatic Control; Installations on British Open-Hearth Furnaces. J. D. May and W. G. Askew. *Iron & Steel*, v. 25, Feb. 1952, p. 49-52, 59.

Surveys the above. Includes general principles of operation, and details of various control schemes. Diagrams.

3820 An Experimental Furnace for the Investigation of Open-Hearth-Furnace Combustion Problems. Part V. Experiments With the Venturi Port and Modifications Thereof. Part VI. Summary of Results and Their Application in Practice. J. F. Allen, J. R. Hall, and A. H. Leckie. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 37-48.

The effect on heat-transfer of the position of the gas-port nose and the steepness of the ramp roof in ports of the Venturi type were examined. Improved results were obtained by moving the gas port back, and by steepening the roof ramp. Extent to which the experimental results obtained have been applied in practice, is summarized. Arrangements for future investigations of openhearth furnace combustion problems are briefly outlined.

3821 Some Aspects of the Blast-Furnace Situation in the United States. Owen R. Rice. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 89-108. (A condensation.)

Operation statistics for more than 100 furnaces in Northern and Southern states are tabulated, and are analyzed and compared in the light of a rating formula based on the amount of coke burnt per day per square foot of an annulus 6 ft. inwards from the tuyeres; comparable data for British and other blast-furnaces are also presented. Ore and coking-coal resources available to the U.S. iron and steel industry are evaluated, and refractory materials, including carbon hearths and linings, are reviewed. Subsequent to consideration of high-top-pressure operation and experiences with oxygen-enriched air, trends in furnace design, construction, equipment, manning, and costs are indicated.

3822 Joint Discussion on the Papers — "The Smidth Agglomerating Kiln: Plant and Practice at East Moors Works, Cardiff," W. E. Simons; "Sinter Making at Appleby-Frodingham," G. D. Elliot and N. D. Macdonald; "Investigation of the Effects of Controlled Variables on Sinter Quality. Part I. Development of Experimental Sinter Plant and Preliminary Results Using Northants Ore," E. W. Voice, C. Lang, and P. K. Gledhill; and "The Sintering of Northamptonshire Iron Ore," D. W. Gillings, E. W. Voice, C. Lang, and P. K. Gledhill. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 123-128.

Covers the above papers previously published in this journal.

3823 Discussion on the Paper—"Significance of Equilibrium and Reaction Rate in the Blast-Furnace Process,"

J. B. Austin. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 128-135.

Covers the above paper previously published in this journal.

3824 Discussion on the Paper—"The Present Position of the Converter Process: Economic Comparison With Other Steelmaking Processes," B. Batuschka. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 135-139.

Covers above paper previously published in the journal.

3825 Joint Discussion on the Papers—"Some Aspects of the Blast-Furnace Situation in the United States," Owen R. Rice; "Evolution of the All-Carbon Blast-Furnace," J. H. Chesters, G. D. Elliot, and J. Mackenzie; and "Radio-Active Indicators for Blast-Furnace Refractory Wear," E. W. Voice. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 139-146.

Covers above papers previously published in this journal.

3826 Measurement of Air Infiltration in Open-Hearth Furnaces. R. Haynes. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 149-152.

Describes the direct measurement of air flow, in furnace uptakes and in the culverts below the checkers, using a water-cooled Pitot static tube. Generally, infiltration is found between the culverts and uptakes at low air flows, and air is lost between them when the fan speed is high.

3827 Efficient Utilization of Titanium Alloys in Stainless Steel Production. F. St. Vincent and R. W. Rebholz. *Journal of Metals*, v. 4, Mar. 1952, p. 245-246.

Lists Ti alloys used in production of stainless ingots and discusses melting procedures for reasonable recoveries. Phase diagrams.

3828 Hydrogen Reduction of Iron Ore. C. A. Scharschu. *Journal of Metals*, v. 4, Mar. 1952, p. 250-251.

Reviews work done on reduction of iron ore with hydrogen to produce a product suitable for electric-furnace melting.

3829 Equilibrium Between Blast-Furnace Metal and Slag as Determined by Remelting. E. W. Filer and L. S. Darken. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 253-257.

Discusses and presents results of an investigation to determine how far blast-furnace metal and slag depart from equilibrium, particularly with respect to sulfur distribution. Data are graphed and tabulated.

3830 Kaiser Chalmette in Production. *Light Metal Age*, Feb. 1952, p. 12-14, 30.

Describes production of Al by reduction of Al_2O_3 at the above plant.

3831 Blowing a Thomas Converter With Oxygen. *Metal Progress*, v. 62, Feb. 1952, p. 108, 110, 112. (Condensed from "Experiments in Blowing a Thomas Converter With Oxygen," G. Husson, *L'Institut de Recherches de la Sidérurgie*, ser. A, no. 5, Mar. 1949.)

Results of the above experiments showed that the economics of O_2 enrichment hinges upon the relative costs of O_2 and scrap.

3832* Copper and Copper Alloys. 6. Concerning the Metallurgy of Copper. W. G. R. DeJager. *Metalen*, v. 6, Dec. 15, 1951, p. 452-454.

Discusses processes of copper refining, particularly fire refining and electrolytic refining. Photomicrographs show structure of Cu_2O inclusions in Cu.

3833 The Effect of Stirring on the Rate of Desulphurising Carbon-Saturated Molten Iron with CaO-SiO_2-Al_2O_3 Slags. C. E. A. Shanahan. *Metallurgia*, v. 45, Feb. 1952, p. 59-61.

Presents experimental evidence to show the beneficial effects of the above.

3834* Influence of Gases in Steels. (In French.) A. Kohn. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 821-822, 825-827, 829, 831-833, 835, 837-840.

Discusses the solubility of gases in liquid and solid steel; influence of the liberation of CO on the solidifications of rimmed ingots; flake formation; hydrogen embrittlement; aging of steel; blue brittleness, and Bessemer steels of low nitrogen content. Includes charts, tables, macrographs, and diagrams. 83 ref.

3835 Later Work. *Metal Progress*, v. 62, Feb. 1952, p. 112, 114, 116, 118. (Condensed from "Blowing Tests in a Thomas Converter With Oxygen-Enriched Air," P. Leroy and E. Devernay, *L'Institut de Recherches de la Sidérurgie*, ser. A, no. 26, Mar. 1951.)

Presents a study on the reduced time of blast with enriched oxygen blast.

3836* Refining Nickel Matte. C. C. Downie. *Mining Journal*, v. 238, Feb. 1, 1952, p. 114-115.

Discusses the production and handling of nickel matte in blast furnace and converter in so far as garnierite and nickel silicate ores generally are concerned.

3837 Titanium: How It Is Made. *Modern Metals*, v. 8, Feb. 1952, p. 29-31.

Describes in detail the method by which hot $TiCl_4$ vapor is reduced to metallic Ti by hot, semi-molten Mg.

3838* Harmful Inclusions in Certain Kinds of Special Steels. (In French.) Otto Krifka. *Révue de Métallurgie*, Dec. 1951, p. 895-909; disc., p. 910-911.

Shows that macroscopic and microscopic inclusions which arise during the production process must be considered as results of the reduction by precipitation. Results of study of such inclusions and of factors which influence their formation are presented for a variety of stainless and alloy steels. Includes 45 photomicrographs. 11 ref.

3839* Hydrodynamic Study of Bath Blowing in the Basic Bessemer Converter. (In French.) G. Husson. *Revue Universelle des Mines, de la Métallurgie des Travaux Publics, des Sciences et des Arts Appliqués a l'Industrie*, ser. 9, v. 94, Dec. 1951, p. 436-439.

Describes the movement of the molten mass during melting. Hydrodynamic relationships are analyzed. Possible design modifications are discussed on the basis of this analysis.

3840* Progress in the Metallurgy of Iron and Steel. (In German.) Rudolf Graef. *Stahl und Eisen*, v. 72, Jan. 3, 1952, p. 1-10.

Compares steel-ingot production and output per man in the U. S. and in Western Europe. Discusses characteristic blast-furnace data; improvements in ore preparation; the pressure blast furnace; oxygen enrichment; separate smelting of high- and low-grade ores; desulfurization methods; openhearth plants; fuels; charging methods; repair methods; rolling mills; flame scarfing; reheating furnaces; materials handling, etc. Compares American and European practice. Numerous diagrams, graphs, and illustrations.

3841* Experiences With a Box-Type Roof on a 40-Ton Openhearth Furnace. (In German.) Ernst Meier-Cortés. *Stahl und Eisen*, v. 72, Jan. 3, 1952, p. 10-12.

Describes and illustrates new roof design which withstood 774 heats before failure.

3842* Copper As a Contaminant in Openhearth Steel. (In German.) Georg Rockrohr. *Stahl und Eisen*, v. 72, Jan. 31, 1952, p. 118-122.

Surveys the Cu content of scrap and openhearth pig iron from 1926 to 1950 in Germany. Presents a method for the determination of Cu in steel.

3843 Blast Furnace Practice. VI (a.), (b.), and (c.), Generation, Recovery and Use of Heat. Charles E. Agnew. *Steel*, v. 130, Feb. 18, 1952, p. 112, 115, 118, 120; Feb. 25, 1951, p. 88, 90, 93; Mar. 10, 1952, p. 118, 120.

Describes theory of M. L. Gruner based on the premise that the theoretical maximum amount of heat is generated from carbon combustion. Analysis shows the theory to be invalid. Presents comparative data showing that the volume of heat required for furnace operation varies between furnaces because of differences in the character of the raw material used. Part VI-b. discusses reasons for and ranges of these variations. In part VI-c. thermal data on a south Chicago stack are investigated, and discussed.

2. *Metals—Smelting, Reduction, and Refining*

3844 High Top Pressures for Smoother Furnace Operation. John R. Barnes. *Steel*, v. 130, Mar. 3, 1952, p. 89-90, 92.

Discusses the above. Data covering a 5-yr operation of elevated-top-pressure blast furnaces with 22-ft. diam. hearths are presented.

3845* The Reduction of Copper Oxide by Hydrogen. (In Russian.) Pavlinchenko and Ia. S. Rubinchik. *Zhurnal Prikladnoi Khimii*, v. 24, June 1951, p. 666-670.

Experiments were made to study the dependence of the rate of reduction of copper oxide on temperature and the presence of other materials. Results are discussed and charted. 11 ref.

3846* Chemistry of Columbium and Tantalum. VIII. The Nb_2O_5-Ta_2O_5-NbO_2-TaO_2-H_2O-H_2 System. (In German.) Harald Schäfer and Gunther Breil. *Zeitschrift für anorganische und allgemeine Chemie*, v. 267, Jan. 1952, p. 265-276.

Describes arrangement and experimental procedure for determining reducibility of Nb_2O_5 and Ta_2O_5 (and mixtures of the two oxides) in a stream of H_2 plus vapor at 900°C. Data are charted. 28 ref.

Miscellaneous Publications.

3847 Bibliography on the Physical Chemistry of the Open-hearth Process. (Covering the period 1940-1949.) Iron and Steel Institute. Bibliographical Series 8B, 1950, 30 pages. (Z6331 I6b)

3848 Bibliography on Design, Manufacture, Properties and Use of Ingot Moulds for Steel Ingots. (Covering the period 1935-1950.) Iron and Steel Institute. Bibliographical Series 3A, 1951, 18 pages. (Z6331 I6b)

3849 Methods of Increasing Inland Steel's Open-Hearth Production. George C. Lawton. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 43-50; disc., p. 50-52. (TS1 Am350)

Deals with increasing steel production through the use of existing units. Factors such as quality of scrap, furnace operation, decreasing charging time and various others are considered.

3850 Increase in Ingot Production by the Use of Oxygen. E. H. Leathers and C. W. Drabers. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 53-56; disc., p. 56-58. (TS1 Am350)

Discusses the above. Considers the amount and quality of raw materials and the necessary auxiliary equipment to properly change increasing tonnage and to handle it after it has been obtained as primary factors in use of O_2.

3851 Jet Tapper Practice at the Open Hearth. H. J. Walker and A. Robert Almeida. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 81-86. (TS1 Am350)

Describes operating principles and development of the above. Some recent results are discussed.

3852 Safety Precautions in Jet Tapping. R. H. Ferguson. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 87-91; disc., p. 91-92. (TS1 Am350)

Describes and illustrates equipment and procedures of above method for tapping openhearth furnaces. Explosives are used, resulting in substantial advantages in safety.

3853 Furnace Design for Increased Production. D. R. Loughrey. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 93-98. (TS1 Am350)

Discusses factors to be considered in the above. Includes roof construction, front-wall, back-wall, and bottom construction, checkers, flues and stacks, and uptakes.

3854 Some Metallurgical Advantages of the Acid Open-Hearth Process. H. P. Rassbach. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 109-115; disc., p. 115-119. (TS1 Am350)

Points out advantages of the above. Considers such problems as why large nonmetallic inclusions are sometimes found in the interior of large steel sections, the outside of which is flawless, and why a long holding period in a ladle is ineffective in producing clean steel. 10 ref.

3855 Types of Charges and Their Effects on Production Rates. A. R. Altman and Edward Walkowski. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 120-125; disc., p. 125-127. (TS1 Am350)

Presents system followed by the Heppenstall Co. in connection with scrap compositions for the openhearth. Data on 20 groups of 50 heats each are given. Tables and graphs.

3856 Importance of Ladle Lining. C. E. Sumpter. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 172-174; disc., p. 174-178. (TS1 Am350)

Discusses properties of ladle brick and factors prolonging ladle life.

3857 Factors Affecting Spread in Manganese Between First and Last Ingots of Rimming-Steel Heats. Michael Tenenbaum and C. C. Brown. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 208-213. (TS1 Am350)

Discusses causes of Mn losses between pouring the first and last ingots. Contributes limited data regarding slag-metal conditions, in order to develop a more coherent picture. Data are graphed and tabulated.

3858 Factors Affecting Spread in Manganese Between First and Last Ingots. Ralph D. Hindson. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 214-219; disc., p. 219-221. (TS1 Am350)

Investigation on the above showed that losses of Mn were due to type of steel, Mn content, Si content, time in ladle, basicity of furnace slag at tap, and type of ladle lining used. Some methods of decreasing these losses are discussed. Data are graphed.

3859 Factors Affecting Surface Quality of 0.40 to 0.55 Per Cent Carbon Killed Steel. A. K. Moore. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 230-234. (TS1 Am350)

On the basis of experiences of Steel Co. of Canada, reduction of S, reduction of track time, increasing the rate of pour, and producing better slag-to-metal equilibrium at the block, are recommended for reduction of rejections in the above range of forging-quality steels. Data are graphed.

3860 Production of Mechanically Capped Steel Over 0.15 Per Cent Carbon. E. N. Hibbert. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 234-237. (TS1 Am350)

Major features of the practice in use at Ohio Works of U. S. Steel Co. include: low-melt sulfur in order to obtain low sulfur without "working" sulfur, furnace practice leading to a well oxidized bath at tap, including tapping at approximately 0.10% C, recarburizing with coal in the ladle, and use of NaF in the molds.

3861 Factors Affecting Surface Quality of 0.40 to 0.55 Per Cent Carbon Killed Steel. A. E. Reinhard. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 225-226. (TS1 Am350)

Silicon content, sulfur content, and temperature are included in a survey on the above.

3862 Factor Affecting the Surface Quality of Killed Steel Containing 0.15 to 0.20 and 0.40 to 0.55 Per Cent Carbon. L. W. Fleming. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 222-225. (TS1 AM350)

Reviews briefly experience in the manufacture of various grades of steel with special emphasis on: furnace working

practice and deoxidation, effect of S and Mn on quality of product, pouring practice, including mold conditioning and mold-coating practice, and transit time. Data are tabulated.

3863 Factors Affecting Surface Quality of 0.40 to 0.55 Per Cent Carbon Killed Steel. D. J. Taylor. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 227-230. (TS1 Am350)

Surveys the above. Includes such factors as pouring practice, mold preparation, control of furnace temperature, and extensive observations of soaking-pit heating practice.

3864 Control of Low-Carbon and Killed Steel for Deep-Drawing Quality. A. E. Reinhard. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 247-249. (TS1 Am350)

Briefly surveys the above. Principal items to guard against in the scrap are alloys and sulfur.

3865 Manufacture of Low-Carbon Rimmed and Killed Steels for Deep Drawing. Karl L. Fetters. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 250-252. (TS1 Am350)

Discusses the above. Methods for deoxidizing the steel are presented.

3866 High-Iron Ore Charges for Cold-Metal Heats. H. M. Parker. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 259; disc., p. 259-260. (TS1 Am350)

Discusses the practice of charging ore in cold-metal heats to obtain a reasonable melt carbon with above normal percentages of iron in the charge.

3867 Use of High-Pressure Gas in the Open Hearth. Milton P. Burns. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 311-316. (TS1 Am350)

Briefly surveys the functions of atomizing fluids. Discusses gases available as atomizing agents. Results of experiments conducted by the Tennessee Coal, Iron and Railroad Co. showed that, with a burner of proper design, natural gas could be substituted for steam as an atomizing agent.

See also:

3796 (new processes for Zn and Ti recovery)
3799 (cobalt metal production)
3806 ("Extraction of Nonferrous Metals")
3903 (segregation in openhearth ingots)
4098 (hydrogen distribution in ingots and forgings)
4148 (slag-iron interfacial tensions)
4383 (temperature control of blast-furnace stoves)
4391 (openhearth bath pyrometry)
4392 (bath temperature control in openhearth)
4538 (refractories for electric furnace bottoms)
4549 (basic-silica refractory combinations in openhearth roofs)
4550-A (linings for hot-metal mixers)
4887 (electrical conductivity of molten iron oxide)

3. FOUNDRY PRACTICE

3868 Sand Treatment. Part I. A. S. Beech, *Canadian Metals*, v. 15, Feb. 1952, p. 28, 30-31.

Discusses the characteristics of an efficient sand mill, contrasting batch with continuously operating mills. Stresses the importance of control of grain size, moisture content, and reconditioning sand. (To be continued.)

3869 Steel Founders' Society Marks Fiftieth Anniversary. *Foundry*, v. 80, Mar. 1952, p. 86-91, 249.

Describes and illustrates new developments in foundry practice and reviews research promoted by above society.

3870 Modern Trends in Molding Machines and Core Blowers. George E. Miller. *Foundry*, v. 80, Mar. 1952, p. 102-105, 215-216.

Illustrated.

3871 Experimental Production of Nodular Graphite in Cast Iron. Alexander I. Krynitsky and Harry Stern. *Foundry*, v. 80, Mar. 1952, p. 106-111, 243-246.

Discusses and presents results of an investigation conducted to study the effect of composition, melting and pouring temperatures, nucleation technique, and cooling rate, and of such addition agents as Mg, MgO, magnesite, FeS, Ca, Ni, Cr, Mo, and B on the formation of nodular graphite in cast iron. This study supports the belief that nodular graphite is formed in the melt during solidification, and graphite patches are produced after solidification by decomposition of carbides. (To be continued.)

3872 Effect of Raw Materials on Cupola Operation. Bernard P. Mulcahy. *Foundry*, v. 80, Mar. 1952, p. 144, 148, 153.

Discusses the above as it effects quantity and quality of pig iron. (To be continued.)

3873 Further Discussion of Resin in Foundry Practices. *Foundry Trade Journal*, v. 92, Feb. 14, 1952, p. 175-177.

Presents a discussion on a paper "Synthetic Resins in the Foundry," G. L. Harbach and P. G. Pentz, published in July 5, 1951 issue.

3874* Use of Heat-Radiating Liners for Risers in Steel Castings. (In German.) E. Lanzendörfer. *Giesserei*, v. 38, Dec. 27, 1951, p. 661-664.

Describes a new British process for heating the sides of liners and in this way keeping the melt warm much longer than usual. Method of operation is discussed and illustrated; advantages are indicated.

3875* Internal Stresses in Continuous Aluminum Casting. (In German.) A. Roth. *Giesserei*, v. 38, Dec. 27, 1951, p. 667-668.

Discussion concerning a previous article on above subject by G. Seeger (v. 38, 1951, p. 325-329.) Includes author's reply.

3876* Innovations and Possibilities for Development in Foundry Mechanization. (In German.) E. Knipp. *Giesserei*, v. 29, Jan. 10, 1952, p. 2-6.

Diagrams and illustrations show possibilities for the above. Methods for mechanizing the foundry process by shortening the transportation within the plant and decreasing the amount of material involved in casting are discussed. Utilization of waste sand and various types of new machinery for continuous casting are described.

3877* Lost Wax Casting Process in Foundry Practice. (In German.) W. Heimann. *Giesserei*, v. 29, Jan. 10, 1952, p. 6-9.

Describes and illustrates above process. Advantages in savings of material and casting of material of poor machinability is discussed; future possibilities are indicated.

3878 Coke Charge and Coke Quality for Cupola Melting. (In Swedish.) W. von Preen. *Gjuteriet*, v. 41, Dec. 1951, p. 183-185.

Discusses problems involved in use of poor-quality coke and methods for minimizing the difficulties encountered.

3879* Further Mechanical Aids for the Foundry. A. S. Beech. *Institution of Mechanical Engineers, Proceedings*, (Industrial Administration and Engineering Production), v. 165, W.E.P. 63, 1951, p. 27-34; disc., 34-41.

New mechanical and semimechanical devices put into practice in the foundry between 1942 and 1949 are described. They include the molding machine, brake block production and a modern knockout station, sand preparation and reconditioning, and a multiple-belt storage hopper. Mechanization in the jobbing foundry is also discussed. Illustrated.

3880 Investment Casting Quality Tied to Gating, Mold Turbulence. Rawson L. Wood and Davidlee Von Ludwig. *Iron Age*, v. 169, Feb. 21, 1952, p. 93-96.

Discusses and presents results of a study to determine physical property curves for commonly used ferrous and nonferrous alloys as secured by normal investment foundry processing. Variables being investigated are: pouring temperature and its effect on grain size and ductility, investment and flask-temperature effects on grain size and mechanical properties, effect of turbulence as controlled by gating technique, effects of standard

3. *Foundry Practice*

heat-treatment techniques in developing desired mechanical properties, and effects of environmental variations on final mechanical properties.

3881 Fluidity and Solidification Tests for Molten Steels. W. Ruff. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 21-25.

A mold with a 400-mm. channel length and a 5-mm. channel diam. is shown to give information on the mechanism of flow, but none of the molds examined is suitable for fluidity estimations. For the control of steelmaking processes, an accuarte method for determining the temperature of molten samples when solidification starts is required; a new pot mold, in which the channel is discarded, provides a sensitive sampling method that requires no built-in measuring instrument.

3882 Bibliography of the Die Casting Process. Part VI. Harold Bourassa. *Light Metal Age*, Feb. 1952, p. 28, 31.

3883 In the Foundry: Control of Temperature Gradient During Solidification. *Light Metals*, v. 15, Feb. 1952, p. 55-57.

Discusses problems encountered in casting Al alloys, stressing the above. Illustrated.

3884* The Production of Very Small Die Castings. H. K. Barton. *Machinery* (London), v. 80, Jan. 31, 1952, p. 201-208.

Discusses the accuracy of small castings as related to die size. Various features related to center-gated dies are outlined. Methods employed for threaded components are given. Diagrams.

3885* Investment Casting. *Machinery* (London), v. 80, Feb. 21, 1952, p. 311-319.

Presents review of equipment, methods and techniques employed by Birmingham Small Arms Co., Ltd., Sparkbrook, Birmingham, England. Application is to low-alloy steels.

3886* Progressive Die With Dial Transfer Device. *Machinery* (London), v. 80, Feb. 21, 1952, p. 331-333.

Describes and diagrams the above.

3887* Simplification in the Production of Medium Sized Cast Pieces. (In Dutch.) A. Cappon. *Metalen*, v. 6, Dec. 15, 1951, p. 441-447.

Describes, diagrams, and illustrates improved system for sand casting fairly large iron castings. The method is called "molding with the joint facing upwards." Important savings in sand, handling, and time are claimed. Cement sand can replace loam in the semipermanent mold system described. For certain castings, the mold may be fully permanent.

3888 Low-Pressure Die-Casting; Current Practice With Aluminum Alloys. H. K. Barton. *Metal Industry*, v. 80, Feb. 1, 1952, p. 87-88.

Discusses the cold-chamber process, using pressures of 100 atm. or higher. Mechanical properties resulting from the technique are tabulated.

3889* Repairing Cast Iron Cylinders for Rolling Mills by Means of Cast Material. (In Italian.) R. Rolla and A. Colle. *Metallurgia Italiana*, v. 44, Jan. 1952, p. 6-8.

The repair was carried out by washing the surface to be welded with molten cast iron until it softened, then machining to necessary dimensions. Describes application to repair of 17-30 in. diam. cylinders weighing 2-4 tons. Includes weld photomicrographs.

3890* Pressure Casting. M. Grunberg. *Microtechnic* (English Ed.) v. 5, Nov.-Dec. 1951, p. 353-364; disc., p. 365. (Translated from the French.)

Discusses the above with reference to the method, hot- and cold-chamber machines, alloys used, and possibilities and future for die casting. Diagrams and tabular data.

3891* Precision Casting. M. Pomey. *Microtechnic* (English Ed.) v. 5, Nov.-Dec. 1951, p. 325-342; disc., p. 343-344. (Translated from the French.)

Discusses in detail the wax pattern and plaster-mould method for the above.

3892 Sealing Metal With Metal; Tincher Impregnation Process for Salvaging Porous Castings. D. W. Holmes. *Modern Metals*, v. 8, Feb. 1952, p. 53-54.

Describes a process used by Tincher Products Co., Sycamore, Ill. which employs metallic oxides as sealants for castings. Process can be used for the impregnation of Al, Mg, and Zn die castings as well as for sand-cast iron, steel, stainless, bronze, brass, Al and Mg.

3893* Better Looking Product Plus Greater Density With Investment Casting. Chas. W. Snyder. *Precision Metal Molding*, v. 10, Feb. 1952, p. 81-84.

Describes how investment casting of nickel valve bodies, bonnets, and wedges has resulted in improved appearance, reduction in weight of metal in the finished valve, and reduction of scrap due to machining. Includes micrographs.

3894* 31-Pound Permanent Mold Casting Combines Accuracy and Economy With Exceptional Size. *Precision Metal Molding*, v. 10, Feb. 1952, p. 39, 63-64.

Describes the permanent mold casting of an Al oil pan by Continental Motors Corp.

3895 Rare Metals Require Precision Furnacing. Frank Gibadlo. *Steel*, v. 130, Mar. 3, 1952, p. 76-78.

Describes new concepts and techniques in the furnacing and casting of the less-common metals. Use of high-vacuum techniques and inert-gas atmospheres are said to be mandatory for Ti, Zr, Ta, Ch, U, Th, Ca, and Mg.

Miscellaneous Publications

3896 A Monolithic Lining for Cupolas. James L. Willis. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 257-258; disc., p. 258. (TS1 Am350)

Discusses advantages and disadvantages of using "air-emplacement process." Called the Bondactor, the gun is designed so that compressed air feeds a premixed dry grog of 45% ganister, 30% sand, and 25% fireclay to the gun nozzle, where it is hydrated in an atomized spray of water.

Books

3897 Casting Alcoa Alloys. 135 pages. 1951. Aluminum Company of America, Gulf Bldg., Pittsburgh 19, Pa. (TS555 A182c)

Surveys the above giving an account of general characteristics, foundry considerations and principles, heat treatment, mechanical and physical properties, and numerous applications.

3898 Foundry Work. Edwin W. Doe. 109 pages. 1951. John Wiley & Sons, New York. (TS230 D67f)

Presents the simple principles of foundry practice, first by referring to the several phases of the industry in a general way, thereby arousing interest in the subject, and secondly by arranging a series of molding problems that will exemplify the application of this knowledge in a practical manner.

See also:
4070 (grain structure in castings)
4513 (refractories for foundry melting equipment)

4. METALS—PRIMARY WORKING

3899* New Forging Technique Utilizes Instrument Controlled Radiant Gas Heating Equipment. C. C. Roberts. *American Gas Journal*, v. 176, Feb. 1952, p. 16-17.

Describes equipment for heating steel rods to the correct temperature for forging. Discusses advantageous forging qualities attained. An illustration of SAE 52100 steel shows the difference in grain structure produced by high-speed radiant gas heating and by conventional slower methods.

3900* Heat Transfer and Furnace Efficiency in the Rapid-Heating of Steel. (In German.) C. A. Landfermann. *Bau und Betrieb*, v. 4, Jan. 1952 (supplement to *Gas- und Wasserfach*, v. 93, Jan. 1, 1952), p. 1-3.

Discussion includes tabulated and graphed data, showing a linear relationship between rate of charge per unit hearth area and attainable thermal efficiency. Applicable both to heat-treating and hot-working operations.

3901* Die Forging of Steel. J. D. Latta. *British Steelmaker*, v. 18, Feb. 1952, p. 82-88.

Describes the process of die forging as applied in the steel industry. The principles of die design and the manufacture of dies are discussed in order to give the designer of the forgings an insight into the possibilities of this forging process both from the production and the cost point of view. The forging process and the plant used are also described in some detail.

3902* Commission of Engineers of Large and Small Rolling Mills. (In French.) *Circulaire d'Informations Techniques*, v. 9, Jan. 1952, p. 91-112.

Presents summaries of a series of reports by various authors on rolling mills with respect to means of protecting steel, rolling of incompletely solidified rail ingots, deformation of the segregated zone of rimmed soft steel during rolling, etc. Includes tables, diagrams, and photographs.

3903* Influence of the Distribution of C, P, and S on the Use of Ingots of Rimmed Openhearth Steel for the Production of Tubes. (In Czech). Vaclav Rauner. *Hutnické Listy*, v. 6, Dec. 1951, p. 582-586.

A study was made of the effect of segregation on the use of rimmed openhearth ingots for the production of seamless tubing. The steels used contained up to 0.15%C. Includes 117 macrographs of ingot structures.

3904 A Theory of Tube Sinking. S. Y. Chung, and H. W. Swift. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 29-36.

Describes the stresses and strains during tensile sinking of tubes. A theory is developed to calculate the sinking load, and to predict thickness and elongation strains that occur during tube sinking in dies of industrial profile. Friction, bending, thickness variation, and strain-hardening are considered. Effects of "thickness" stress distribution on strain development were investigated for steel, brass, and Cu.

3905* Forming Titanium Parts for Aircraft. O. A. Wheelon. *Machinery* (London), v. 80, Feb. 7, 1952, p. 223-228.

Describes tests made to determine fabrication characteristics for design and manufacturing guidance. Production operations are described.

3906* Heavy Crankshafts. Production of Integral Fibrous Structure. (In French.) J. M. Vialle and J. Lafont. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 929-931, 933.

Describes the structure of a steel ingot, and changes which it undergoes upon hot transverse deformation. Tells how hot forging can be used to produce crankshafts having above structure. Indicates advantages over former methods. Includes micrographs, sketches, photographs, and tables.

3907 Roll Size Effects in Rolling of Strip. N. H. Polakowski. *Metal Progress*, v. 62, Feb. 1952, p. 67-71.

Shows why roll diameter limits maximum draft and minimum thickness, but has no important effect on power required per ton of thin strip rolled.

3908 Metallurgy of Drop Forging. E. Gregory. *Metal Treatment and Drop Forging*, Feb. 1952, p. 67-72; disc., 72-74.

Describes and discusses the above, including overheating and burning.

3909 Tool and Die Materials for the Extrusion of Non-Ferrous Metals. *Metal Treatment and Drop Forging*, Feb. 1952, p. 86-88.

Presents a discussion on the above sponsored by the Institute of Metals at the University of Birmingham.

3910* The Working of Metals. W. C. F. Hessenberg. *Sheet Metal Industries*, v. 29, Feb. 1952, p. 144-146. (A condensation.)

Deals with the influence of internal and external strains on the properties of metals and alloys, with special reference to wire-drawing and rolling-mill operations.

3911* Gaging and Preparation Process for Drawing-Die Holes With Predetermined Rounding-Off Radii and Bearing Lengths. (In German.) Siegfried Werth. *Stahl und Eisen*, v. 72, Jan. 17, 1952, p. 66-69.

Discusses accuracy of measuring the bearing length of finished drawing dies by the two-needle method; calculation of the initial bearing length of a sharp-edged die contour; and determination of the rounding-off radius by intermediate measurements during manufacture. Schematic diagrams and tables.

3912* Effect of Coil Weight and Rolling Speed on the Hourly Output of Cold Rolling Mills. (In German.) Hans Pannek. *Stahl und Eisen*, v. 72, Jan. 17, 1952, p. 70-75.

Describes development of output diagrams: for rolling heavy sections, for rolling thin sections, for reversing mills, for a tandem mill. Graphs.

3913* Output and Efficiency of Cold Rolling Mills Shown by a Graphical Method of Universal Validity. (In German.) Werner Lueg. *Stahl und Eisen*, v. 72, Jan. 17, 1952, p. 75-79.

Describes derivation of the efficiency of cold-rolling mills and of their output from the rolling-time formula of A. Pomp. Two nomographs for application are presented.

3914* Modern Controls and Drives for Rolling Mills. (In German.) Conrad von Kissling. *Stahl und Eisen*, v. 72, Feb. 14, 1952, p. 165-173; disc., p. 173-174.

Discusses the above giving limitations for each type.

3915 Toned-Down Noise Tunes Up Operations. Charles E. Crede. *Steel*, v. 130, Feb. 25, 1952, p. 76-77. (A condensation.)

Considers the factors contributing to the noise level in metalworking. Briefly gives a few ways to combat this problem.

3916* Greater Flexibility in Aluminum Extrusion Cuts Cost of Short Runs. Herbert Friedman. *Western Metals*, v. 10, Feb. 1952, p. 47-48.

Describes techniques, at Pax Metal Corp., Los Angeles, of billet heating and extrusion which permit greater flexibility and consequently lower cost per unit for short production runs.

3917 Beryllium Copper Wire: Its Processing and Uses. John T. Richards. *Wire and Wire Products*, v. 27, Feb. 1952, p. 149-154, 192-193, 195.

Covers the above. Includes drawing, heat-treating, plating, joining, and applications. Tables, graphs, and illustrations. 13 ref. (To be continued.)

See also:

3840 (rolling-mill practice—U.S. and Europe)
3946 (drop-forging lubricants)
3950 (cold-working of metals—Russian book)
4171 (rolling of Mo sheet—orientation effects)
4335 (rolling-mill quality control)
4411 (forging of turbine blades)
4755 (plastic tooling in aircraft production)
4962 (drawing of tube containing wire core)

5. METALS—SECONDARY WORKING

3918* Stretch-Forming. Part 1. Construction and Operation of the Sheridan Longitudinal Machine; Forming Technique. Richard Wood. *Aircraft Production*, v. 14, Mar. 1952, p. 77-84.

Presents an extensive description of the above.

3919* Reduction of the Zone of Plastic Deformation Taking Place During Machining of Metals Under the Action of Surface-Active Liquids. (In Russian.) G. I. Epifanov and L. A. Shreiner. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 11, 1951, p. 781-782.

Depths of the zone of plastic deformation of aluminum under various conditions of machining were studied. Data are discussed, charted, and illustrated.

3920* Manufacture of Extruded Aluminum Cylindrical Containers With Clamped Tops. (In Italian.) P. Balduzzi. *Alluminio*, v. 20, Dec. 1951, p. 553-557.

Describes, diagrams, and illustrates equipment and procedures of Italian plant for impact extrusion of above cans.

3921 CO_2 Cools Tools. Paul E. Brunberg. *American Machinist*, v. 96, Mar. 3, 1952, p. 129-132.

An introduction, discussing advantages and disadvantages of CO_2 as coolant, is given by E. J. Tangerman. Above article describes use of solid or liquid CO_2 on hardened tool steel, Ti alloys, Hastelloy, Inconel, and high-Ni and Cr-Co compositions.

5. *Metals—Secondary Working*

3922 Arc Machining Makes Hard-to-Cut Jobs Easy. H. V. Harding, V. E. Matulaitis. *American Machinist*, v. 96, Mar. 3, 1952, p. 136-141.

Describes the above process. Basically, it consists of the development of a series of electrical discharges, called intermittent arcs, between an electrode and the surface of a metal workpiece in the presence of a fluid. Factors to be considered are discussed, applications are given.

3923 How to Drill Titanium Alloys. *American Machinist*, v. 96, Mar. 3, 1952, p. 141.

Presents available data on drilling, reaming and tapping the material, based on recent tests.

3924 Titanium Ground by Lockheed. *American Machinist*, v. 96, Mar. 3, 1952, p. 175.

Outlines some recent research on the above by Lockheed Aircraft Corp.

3925* Oxygen Cutting of Steel by a Two-Flame Kerosene Torch. (In Russian.) S. V. Begun. *Avtogennoe Delo*, v. 22, May 1951, p. 24.

The apparatus for the above is described and illustrated.

3926 Cutting and Flame Processing. R. S. Babcock. *Blast Furnace and Steel Plant*, v. 40, Feb. 1952, p. 215-219.

Discusses various flame-cutting applications to heavy equipment, scrap, slabs, ingots, etc.

3927 New Cutting Methods Cope With Ever-Harder Alloys. *Business Week*, Mar. 15, 1952, p. 144-146, 148.

Describes the use of dry ice to cool the workpiece and cutting tool in machining "unmachinable" alloys; i.e., high Cr, W, or Co, and Ti. Also discusses the electric-arc machining method.

3928 Machinability of Metals. Francis W. Boulger. *Canadian Metals*, v. 15, Feb. 1952, p. 52.

Presents various theories resulting from scientific research on properties important in machining.

3929* Theory of Electric Spark Machining. E. M. Williams. *Electrical Engineering*, v. 71, Mar. 1952, p. 257-260. (To be published in *AIEE Transactions*, v. 71, 1952.)

The electric spark machining process is assuming industrial importance in the tool and die industry. A typical electric system for this process is described and a theory advanced for the mechanism of its operation together with results of experimental tests. 13 ref.

3930 New Methods for Testing Machinability of Gray Iron. Edward A. Loria. *Foundry*, v. 80, Mar. 1952, p. 174-175, 178, 180, 182.

Experimental data on various types are tabulated, charted, and discussed.

3931* The Effect of Speed and Feed on the Mechanics of Metal Cutting. B. T. Chao and G. H. Bisacre. *Institution of Mechanical Engineers, Proceedings* (Industrial Administration and Engineering Production), v. 165, W.E.P. 63, 1951, p. 1-9; disc., 10-13.

With respect to cutting speed or feed of a metal cutting tool, changes in the geometry of the chip, tool forces, tool build-up, and surface finish occur. A logical theory to explain these variations in the mechanics of the process is attempted. The problem of tool wear is not included. A series of tests was conducted on mild steel and Cu, over a wide range of speed, feed, and tool angle. Results are presented and discussed.

3932* The Fundamental Geometry of Cutting Tools. G. V. Stabler. *Institution of Mechanical Engineers, Proceedings*, (Industrial Administration and Engineering Production), v. 165, W.E.P. 63, 1951, p. 14-21; disc., 21-26.

A full geometrical analysis of a cutting-tool edge is made. The fundamental angles are related to traditional workshop terms, and may readily be applied to any cutting tool. A law of chip flow is given and its effects on the resulting chip shape are analyzed. The effect of unit cube passing through the shear plane is also analyzed and a method is given for finding the direction cosines of the axes of the ellipsoid of stress. The flow law is used to find the directions of the cutting force between chip and tool and its various components. Although predominantly theoretical, the paper has a practical background.

3933 Manufacture and Use of Graphitic Tool Steels Show Vast Progress. Parts I and II. A. F. Sprankle. *Iron Age*, v. 169, Feb. 28, 1952, p. 100-103; Mar. 13, 1952, p. 106-110.

The effect of graphite content on machinability of toolsteels was studied. Studies of milling energy vs. graphitic carbon content and of effect of graphitization on drilling torque and thrust also made. Data are graphed. Extensive tabular data on graphitic toolsteel applications are given.

3934 Russians Machine Bearing Balls Electro-Mechanically. Henry Brutcher, translator. *Iron Age*, v. 169, Mar. 13, 1952, p. 98-99. (From paper by N. A. Pankratov, P. B. Gofman, and M. M. Feldman, *Promyshlennaya Energetika*, Oct., 1950, p. 10-11.)

Tells how low-alloy bearing balls are machined electromechanically at Russia's State Bearing Works. Balls roll between charged upper and lower disks. Lower disk rotates at 500 to 600 rpm. Microarcs soften ball surface and rotating disk throws off softened metal particles. Metal removal varies directly with voltage. Slightly pitted and decarburized surface of ball is removed by hard lapping. Balls can be fed into machine and removed automatically, permitting high production rates.

3935* Design and Application of Tungsten Carbide Blanking and Piercing Tools. K. L. Pickett. *Machinery* (London), v. 80, Jan. 31, 1952, p. 209-213. (A condensation.)

Continues a discussion on various points to be observed in designing cemented-carbide press tools.

3936* Methods of Machining and Grinding Stellite; Techniques Employed by Deloro Stellite, Shirley, Birmingham. *Machinery* (London), v. 80, Feb. 14, 1952, p. 274-279.

3937* New Cutting Fluid Eliminates Rust, Gum, Stink. William F. Schleicher. *Machine and Tool Blue Book*, v. 48, Mar. 1952, p. 251-254, 256.

Describes the above, referred to as "Trim." It is the result of several years' intensive research which delved deeply into the causes of gumming and other objectionable features of cutting fluids. Findings of research projects are embodied in this new cutting fluid. With this coolant, it is said to be necessary to change tools only once in every 4-6 wks.

3938 Improvements in Quality of Deep Drawing Sheet Steel. T. F. Olt and R. S. Burns. *Metal Progress*, v. 62, Feb. 1952, p. 51-56.

Discusses changes in manufacturing methods. Surveys the variation in properties in drawn steel and its causes. Other means of securing a greater degree of uniformity in mechanical properties and drawing behavior are described. Future trends are briefly cited.

3939 Deep Drawing; Development of Aluminum Bronze Alloys for Dies. S. C. Jones. *Metal Industry*, v. 80, Feb. 22, 1952, p. 152-153.

Discusses requirements of a successful die material and describes work undertaken by Rolls-Royce, in collaboration with N. C. Ashton, on the development of an Al-bronze composition with a high Brinell hardness, suitable for the above. Fabrication of the dies, including centrifugal sand casting, machining, and finishing, is described.

3940* 2nd Biennial Meeting Concerning High Precision Mechanics. *Microtechnic* (English Ed.), v. 5, Nov.-Dec. 1951, p. 259-425.

A series of papers on various aspects of high-precision production and inspection, presented at Paris, Sept. 5, 10, 1951. Selected papers are separately abstracted.

3941* Superfinish in the Service of Precision. A. Meynier. *Microtechnic* (English Ed.) v. 5, Nov.-Dec., 1951, p. 309-314; disc., 315-316. (Translated from the French.)

With respect to precision finishing, lapping, honing, new processes, and examples of mechanical super- and micro-finishing are discussed.

3942* Use and Manufacture of High Precision Antifriction Bearings. M. Pichaud. *Microtechnic* (English Ed.), v. 5,

Nov.-Dec. 1951, p. 368-383; disc., p. 384-386. (Translated from the French.)

Discusses the precision bearing, its applications, conditions of use and manufacture. Diagrams and tabular data.

3943* Stretch-Forming Magnesium. Robert B. Stanton. *Modern Machine Shop*, v. 24, Mar. 1952, p. 228, 230.

Discusses and illustrates internally-heated stretch dies developed by North American Aviation and Consolidated Vultee Aircraft for the above.

3944 Forming Dies Made of Densified Wood. *Modern Metals*, v. 8, Feb. 1952, p. 34.

Forming dies made of wood impregnated with Bakelite phenolic resins are being used in the deep and shallow drawing of Al parts. The new material is called "Hi-Den" and applications in production of military and civilian parts are given.

3945 Press Load Calculations: Electronics Replaces Theory. *Steel*, v. 130, Mar. 10, 1952, p. 112-113.

Tells how the complicated problem of determining accurately and instantly the actual loads developed in a press under production conditions is solved electronically by use of a new instrument.

3946 Increasing Drop Forging Die Life. Part IX. Die Lubrication. John Mueller. *Steel Processing*, v. 38, Feb. 1952, p. 68-70, 101.

Surveys the above. Discusses graphitized materials as suitable lubricants. Other factors such as proper forging and finishing temperature are considered.

3947 Hot Forming Practice at Northrop Aircraft. Part II. Gilbert C. Close. *Steel Processing*, v. 38, Feb. 1952, p. 76-79.

Discusses results of tests to determine the effects of various hot-forming methods on mechanical properties of some Al alloys. Illustrations and graphs.

3948 Tool Materials. Lester F. Spencer. *Tool Engineer*, v. 28, Mar. 1952, p. 129-131.

Reviews characteristics of the above. Includes cemented titanium carbides, high-speed Mo steels, and several non-deforming oil- and air-hardening toolsteels.

3949* Titanium; Cutting Its Alloy With Band Tools. H. J. Chamberland. *Western Machinery and Steel World*, v. 43, Feb. 1952, p. 80-81.

Discusses some of factors to be considered in the above.

Books

3950 Uchenie o Rezanii Metallov. (Science of Metal Cutting.) N. I. Reznikov. 587 pages. 1947. Government Scientific-Technical Publishing House for Machine Construction Literature, Moscow, U.S.S.R. (TJ1230 R33u)

A textbook on the cutting of metals and the special characteristics of cold working of metals for the machine-design courses of advanced technical schools. Besides material prepared by the author, the book contains summaries of numerous Soviet investigations and of foregin data.

3951 Kholodnaia Obrabotka Metalla Uprochniaiushche-Kalibruiushchim Instrumentom. (Cold Working of Metals by Means of a Hardening and Calibrating Tool.) V. O. Voishko. 83 pages. 1950. Government Scientific-Technical Publishing House for Machine Construction Literature, Moscow and Leningrad, U.S.S.R.

Describes a method of finishing the surface of parts without removing chips, by knurling and flattening with rollers. Basic processes taking place in the metal during its deformation, influence of temperature, and of geometry of the rolls, and their influence on the worked surface are analyzed. Special attention is given to the problems of increasing fatigue strength and finish, treatment under compression, increased wear resistance, and measurement of forces during knurling. In the first chapter, mention is made of behavior of several nonferrous metals. After this, attention is largely confined to various steels. Graphs, tables, diagrams, and illustrations. 38 ref.

See also:
3900 (heat transfer in hot-working of steel)
3909 (extrusion of nonferrous metals)
3915 (noise reduction in metalworking)
4191 (strain aging of patented steel wire)
4193 (machining Ti)
4755 (plastic tooling in aircraft production)
5001 (economic evaluation of parts fabrication)

6. POWDER METALLURGY

3952* Synthesis of Two Copper Tellurides by Compression of Crystalline Copper and Tellurium Powders. (In French.) Raymond Hocart and Roger Molé. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 111-113.

By means of uniaxial compression at 3500-17,500 kg. per sq. cm., two crystalline phases were obtained; in each case a weissite-type phase, and in some cases a ricardite-type phase.

3953* Powder Metallurgy. (In German.) **Part I. The Present Technical and Economic Status of Powder Metallurgy.** R. Keiffer. **Part II. The Scientific Fundamentals of Powder Metallurgy.** G. F. Hüttig. *Angewandte Chemie*, v. 64, Jan. 21, 1952, p. 41-54.

Includes numerous graphs, tables, and illustrations. 84 ref.

3954 Powdered Metals for Hotter Jets. *Business Week*, Mar. 1, 1952, p. 94-96.

Describes how turbine wheels for jet engines can be fabricated through powder metallurgy.

3955* Heat-Resisting Sintered Aluminum. R. Irmann. *Engineers' Digest*, v. 13, Jan. 1952, p. 9-12. (Translated and condensed from *Revue de l'Aluminium*, v. 28, July/Aug. 1951, p. 269-275; Sept. 1951, p. 311-316.)

Previously abstracted from original.

3956 Powder Metallurgy's Contribution to High-Temperature Materials. H. W. Greenwood. *Metal Treatment and Drop Forging*, Feb. 1952, p. 75-80.

Reviews the development of powdered metals and their application during recent years, and indicates the research necssary for future development in certain promising fields.

3957* Mechanical Precision of Parts Obtained by the Powder Metallurgy Process. R. Girshig. *Microtechnic* (English Ed.), v. 5, Nov.-Dec. 1951, p. 345-350; disc., p. 351-352. (Translated from the French.)

An evaluation of the above process with a review of briquetting, sintering, and sizing.

3958* Powder Metallurgy Produces a Brass Ordnance Component; The Fuel Case History of an Important Piece. John Dale. *Precision Metal Molding*, v. 10, Feb. 1952, p. 34-36, 69-72.

Describes problems and techniques used in the production of brass rotors. Micrographs.

3959* Design Data for Low Density Iron Powder Parts. *Precision Metal Molding*, v. 10, Feb. 1952, p. 43-44, 77-79.

Reviews methods of making iron compacts. Includes a discussion on the mechanical properties of sintered-Fe compacts.

See also:
4009 (sprag-sinter process for high-temperature alloys)
4045 (bright dipping of Cu compacts)
4732 (metal powder fillers for fluorocarbon polymers)

7. METALS—WELDING OR JOINING

3960* Report of Special Committee on Continuous Welded Rail. H. B. Christianson, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 683-693.

Presents information on fabrication, laying, fastening, and maintenance in the form of subcommittee reports on each topic.

3961 Welding Jet Engine Parts of Heat Resistant Metals. J. L. Solomon. *Automotive Industries*, v. 106, Mar. 1, 1952, p. 41, 58.

Describes fabrication of jet-engine parts composed of mild steel with Al coating, Ni alloys, W-bearing austenite, stainless, Ti, and martensitic stainless. Discusses problem of welding similar materials having different rates of thermal conductivity.

7. *Metals—Welding or Joining*

3962* Deformation During Welding of Structures of High Buildings. (In Russian.) A. D. Zevin. *Avtogennoe Delo,* v. 22, May 1951, p. 3-6.

Experiments were made with aim of reducing the influence of deformation during welding on the building structures. Results are discussed, charted, and illustrated.

3963* Automatic Welding of Edge Seams With a Carbon Arc Stabilized With a Jet of CO_2. (In Russian.) N. G. Ostapenko. *Avtogennoe Delo,* v. 22, May 1951, p. 6-9.

The conditions for satisfactory application of the above to carbon steels were determined. Results are discussed, charted, and illustrated.

3964* Weldability of Aluminum-Magnesium Alloy. (In Russian.) S. V. Avakian and N. F. Lashko. *Avtogennoe Delo,* v. 22, May 1951, p. 9-13.

A study was made of welds in Al-Mg alloys. The formation of porosity and structural changes occurring during various heating and cooling cycles were investigated. Results are discussed and illustrated.

3965* Welding of High-Alloy, Acid-Proof, and Non-Scaling Ferrite and Austenite Steels. (In German.) Ernst Klosse. *Chemie-Ingenieur-Technik,* v. 24, Jan. 1952, p. 12-18.

General rules are given for the weldability of the various types of the above, mainly used in the chemical industry.

3966* Notes Concerning Welding-On of Gear Teeth. (In Czech.) Josef Nemec. *Hutnické Listy,* v. 6, Dec. 1951, p. 586-589.

Problems connected with the use of welded (built-up) gear teeth in coal-mining equipment are described. Materials deposited are described.

3967 Fabricated Ingot Cars Stand Up Under Severe Operating Conditions. R. G. Fournie. *Iron Age,* v. 169, Feb. 28, 1952, p. 112-114.

Describes and illustrates arc-welding procedures for plain-carbon steel cars designed to withstand severe impact loads at elevated temperatures.

3968 Rolled Sections Replace Forged Jet Blades. *Iron Age,* v. 169, Mar. 6, 1952, p. 227.

Describes fabricating method which will replace forged blades in the compressor stator of the J-47 turbojet engine. Airfoil section of the blades is cut from stainless strip rolled to contour, attached to separately-formed bases by welding. Materials savings: 39%. Cost savings: 55%.

3969 Production Problems. XIII: Welding of Tractor Steering Wheels. *Iron & Steel,* v. 25, Feb. 1952, p. 46-48, 61.

The three spokes of steel tractor wheels were joined to the center boss by projection welding. An investigation was made of the failure in the brittle zone adjacent to the weld but not in the weld itself, and failure in the actual weld. Micrographs. (To be continued.)

3970 Fabrication of Aluminum "Skybeams." *Light Metal Age,* Feb. 1952, p. 8-9.

Discusses spot welding of structural Al floor beams of remarkably high strength-weight characteristics, by Ryan Aeronautical Co. 1,000 weightless spot welds are employed in each of the I-beams which support the cargo-carrying floors of the big Boeing C-97 Strato-freighter.

3971* Resistance Welding Operations on Girling Shock Absorbers. *Machinery* (London), v. 80, Feb. 7, 1952, p. 229-232.

Describes and illustrates the above. Welding machines work on a 2-phase balanced load system, and the welding cycle is controlled by ignition equipment providing phase-shift heat regulation, the heating time being approximately 0.1 sec.

3972* Welding Magnesium Alloys. *Magazine of Magnesium,* Feb. 1952, p. 1-7.

Mg and all of its commonly-used alloys can be welded by gas, arc, and electrical-resistance methods. Discusses in detail the different methods of welding, and notes some of the important characteristics of Mg which affect the welding.

3973 Progress in Welding Light Alloys. P. T. Houldcroft. *Metallurgia,* v. 45, Feb. 1952, p. 81-84.

Surveys the development of the gas-shielded-arc welding process which uses consumable electrodes. Improved materials are discussed. 11 ref.

3974 Spot Welding in Aircraft Assembly. *Modern Metals,* v. 8, Feb. 1952, p. 37-38.

Discusses techniques used for the above by the Ryan Aeronautical Co., San Diego, Calif. Describes "Raco 220," a non-abrasive cleaner for Al.

3975 Spotwelding Highly Stressed Aluminum and Magnesium Assemblies. A. Schoellerman and S. Jenkins. *Product Engineering,* v. 23, Mar. 1952, p. 185-188.

Includes design considerations, mechanical properties, weldability of Al alloy combinations, and weld spacing and dimensions for Al and Mg assemblies.

3976* Outside Shell Assemblies. (In German.) Raimund Pertusini. *Schweisstechnik,* v. 5, Dec. 1951, p. 137-138.

Cost studies of the assembling of ship shells by riveting, fillet welding, shot welding, and spot welding show that spot welding is by far the cheapest method of assembling the shell parts. Includes diagrams and tables.

3977* Some Details of Multi-Spot Welding Technique as Practised at the Luton Plant of Vauxhall Motors, Ltd. A. J. Newson. *Sheet Metal Industries,* v. 29, Feb. 1952, p. 149-157.

Presents diagrams and illustrations on the above. Gives a brief outline of press welding and the possibilities of this method of production.

3978* Notes on Soldering. Lester F. Spencer. *Sheet Metal Worker,* v. 43, Feb. 1952, p. 33, 49-50.

Presents data on nominal composition of various alloys, their melting range, and cites various uses of each.

3979* Suitability of Steels for the Flash-Butt Welding Method. (In German.) Erich Hormann. *Stahl und Eisen,* v. 72, Jan. 3, 1952, p. 19-24.

Gives examples of material and time savings by application of above process to complex sections. Effects of welding conditions on tensile strength and bending angle of flash-welded tubes of hydrogen-resistant steels are described. Describes application of inert-gas-shielded arc welding to Cr and Mo steels. Discusses occurrence of microcracks near the weld. Includes micrographs and macrographs.

3980* The Design and Fabrication of Welded Structures Subjected to Repeated Loading. Part VIII. *Welder,* v. 20, July-Dec. 1951, p. 38-41.

Compares properties of butt welds and reinforced butt welds, and presents effect of shape and machining on fatigue strength of straps attached by fillet welds. (To be continued.)

3981* Welding Procedures for Copper-Base Alloys. Lester F. Spencer. *Welding Engineer,* v. 37, Mar. 1952, p. 17-22.

Covers preliminary considerations such as joint preparation, back-up bars, etc., and the fusion welding of pure Cu, beryllium Cu, and the Cu-Zn alloys. (To be continued.)

3982* Thoriated-Tungsten Electrodes — Their Welding Characteristics and Applications. G. J. Gibson and R. O. Seitz. *Welding Journal,* v. 31, Feb. 1952, p. 102-108.

The theory of arc welding is examined to determine the difference between the action of thoriated- and pure-tungsten electrodes. Application to various ferrous and nonferrous metals and alloys is described. Data are charted and tabulated.

3983* Flash Welding of Components for Aircraft and Similar Applications. J. H. Cooper. *Welding Journal,* v. 31, Feb. 1952, p. 109-115.

Discusses process characteristics of the above. The greater proportion of the materials welded are a group of related steel alloys such as SAE steels 4130, 4135, 4140, 4340, 8740; AMS steels 6371, 6324, 6413, 6359-A.

3984* The Practical Testing of the Cohesive Strength and Weldability of Steels. W. A. Felix. *Welding Journal,* v. 31, Feb. 1952, p. 105s-111s.

Describes various testing methods employed for investigating

the suitability of a steel for use in highly stressed welded structures.

3985 Industrial Brazing. Heating Methods and Equipment. E. V. Beatson and H. R. Brooker. *Welding and Metal Fabrication*, v. 20, Feb. 1952, p. 54-58.

Discusses various types of furnaces and furnace atmospheres with reference to brazing. Graphs and tabular data. (To be continued.)

3986 Making Satisfactory Welded Joints in Wire by Resistance Welding. *Wire and Wire Products*, v. 27, Feb. 1952, p. 161-163, 210-213.

Presents a study of the underlying principles and factors that should be understood if welded joints of optimum quality are to be produced. Materials considered are cold- and hot-drawn low-carbon steel wire.

See also:
3889 (repair welding of cast-iron cylinders)
3917 (joining Be-Cu wire)
3988 (annealing alloy-steel welds in tubing)
4157 (rail repair of wheel burns by welding)
4162 (mechanical properties of welded carbon-steel tubes)
4166 (welding of steel ship plates)
4193 (welding Ti)
4195 (welded tankers—stress studies)
4399 (metal-ceramic seals in vacuum tubes)
4412 (welding low-alloy structural steels)
4413 (alloy steels for welded structures)
4419 (welded steels for machine parts)
4526 (metal-glass seals)
4776 (silicone-rubber bonding to metals)

8. METALS—THERMAL TREATMENT

3987* Summary of Progress on Investigation of Stress Relaxation in Rail Steel. D. R. Jenkins and H. J. Grover. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 916-920.

Presents and discusses results of an investigation to determine possibilities of alleviation of residual stress or fatigue damage by heating rail steel to subcritical temperatures.

3988* Annealing of High-Strength Welds on Steam Generators. (In German.) A. Krause. *Brennstoff-Wärme-Kraft*, v. 4, Feb. 1952, p. 44-47.

Explains briefly metallurgical principles of annealing and discusses annealing of a series of welds on closed vertical tubes and development of suitable burners. Describes useful instrument for controlling the annealing operation. Photomicrographs, photographs, graphs, and tables.

3989* Flame-Hardening of the Leading Edges of Steam-Turbine Blades. (In German.) F. J. Overkott. *Brennstoff-Wärme-Kraft*, v. 4, Feb. 1952, p. 47-49.

Impact of droplets of condensation was found to reduce the life of turbine blades made of Cr steel. Discussion shows that this difficulty can be reduced by reducing steam condensation and by above process. Graphs, photographs, and photomicrographs.

3990 Continuous Annealing System Combines Several Operaitons. *Inco Magazine*, v. 25, Winter 1951-52, p. 15, 27.

Describes continuous strip annealing process at the American Brass Company's new brass mill in Buffalo, N. Y. Production of annealed brass strip is accomplished integrating a number of operations into one continuous system that may be readily controlled.

3991* Electric Furnaces for the Thermal Treatment of Non-Ferrous Metals and Alloys. C. J. Evans, P. F. Hancock, F. W. Haywood, and J. McMullen. *Journal of the Institute of Metals*, v. 80, Feb. 1952, p. 255-256.

Reviews types of furnaces available for thermal treatment of light alloys and Cu, Ni, and their alloys. Reference is made to the use of controlled atmospheres. Emphasis is on furnaces of highly specialized design, which work in conjunction with production lines.

3992* Gas Equipment for the Thermal Treatment of Non-Ferrous Metals and Alloys. J. F. Waight. *Journal of the Institute of Metals*, v. 80, Feb. 1952, p. 269-285.

Burner systems in common use in the nonferrous metal industry are discussed, with emphasis on automatic mixture-control devices, also furnace atmospheres. Describes a catalytic sulfur-removal plant suitable for bright-annealing furnaces. A number of furnace installations are described, illustrating application of the various burner systems, and also the use of mechanical-handling equipment. These installations include a copper-billet-heating furnace, tube-annealing furnaces, and a cover furnace. In the field of light metals, billet-heating furnaces, salt baths, and forced-circulation hot-air furnaces are discussed.

3993* Batch and Continuous Annealing of Copper and Copper Alloys. Edwin Davis and S. G. Temple. *Journal of the Institute of Metals*, v. 80, Feb. 1952, p. 287-296.

Changes in annealing equipment and practices in the production of wrought Cu and Cu alloys are outlined. Annealing characteristics of representative Cu-base alloys are discussed, and reference is made to the effect of impurities on the softening of Cu alloys and to heat-treatment other than annealing to produce soft material, such as stress-relief annealing, solution heat-treatment, and tempering. Various types of batch and continuous furnaces are described, and factors influencing uniformity of annealing and relative merits, limitations, and applications of both types of annealing are briefly considered.

3994* Bright Annealing of Nickel and Its Alloys. H. J. Hartley and E. J. Bradbury. *Journal of the Institute of Metals*, v. 80, Feb. 1952, p. 297-310.

Following brief historical development, conditions which must be fulfilled in different cases are reviewed from a theoretical standpoint; and variations in requirements of different alloys and effects of S and C in the annealing atmospheres are noted. Clean annealing in belt-conveyor furnaces is briefly considered, and special attention is paid to the production of S-free atmospheres from town gas, and to methods of testing the suitability of purging-gas atmospheres for use in annealing these alloys, including a method which avoids dew-point measurements.

3995* Batch Thermal Treatment of Light Alloys. C. P. Paton. *Journal of the Institute of Metals*, v. 80, Feb. 1952, p. 311-322.

After a brief description of the processes of annealing, solution-treatment, precipitation-treatment, stabilization, and the principal differences in thermal conditions which they entail, factors affecting the choice of a furnace are listed. Technical considerations affecting this choice are then dealt with in greater detail under the headings: fuels, heating media, circulation of heating media, furnace atmospheres, temperature measurement and control, quenching and drying, general handling, and constructional materials. Current batch-furnace design is criticized. Data for Al and some of its alloys are presented.

3996* Flash Annealing of Light Alloys. R. T. Staples. *Journal of the Institute of Metals*, v. 80, Feb. 1952, p. 323-334.

Results obtained from treatments carried out on light alloys in a flash-annealing furnace show that a wide range of thermal treatments can be successfully accomplished. The view is expressed that such furnaces represent an advance in technique over the batch-treatment type. The theoretical case in favor of employing high rates of heating to secure a fine grain-size on recrystallization is briefly presented and supported by evidence obtained in industrial practice. Factors governing the design of a single-sheet, conveyor-type furnace are reviewed and performance data reported. Data for Al and a few of its alloys are presented. 16 ref.

3997* Continuous Heat-Treatment of Aluminum Alloys of the Duralumin Type. Marcel Lamourdedieu. *Journal of the Institute of Metals*, v. 80, Feb. 1952, p. 335-339.

Describes a plant designed for the continuous heat-treatment of Duralumin-type alloys. Results of some tests on 24S Alclad are reported.

3998 Coil Annealing. Lee Wilson. *Iron and Steel Engineer*, v. 29, Feb. 1952, p. 66-72; disc., p. 72.

Discusses the use of single-stack annealing furnaces. Advantages are cited.

8. *Metals—Thermal Treatment*

3999* The Function of Energizers in Pack Carburizing. (In Swedish.) Axel Hultgren. *Jerkontorets Annaler*, v. 135, no. 11, 1951, p. 575-604.

Upon study of the various ways in which the energizers K_2CO_3, Na_2CO_3, and $BaCO_3$ may be placed in the carburizer box with crushed charcoal and the objects to be carburized, two methods were found to give the same results as mixing charcoal and energizer: K_2CO_3 or Na_2CO_3 applied separately, e.g., as a layer on top of the charcoal; and $BaCO_3$, applied as a thin coating on the steel surface, preferably with the aid of a binding agent. The coated specimens were packed in unmixed charcoal which had been washed thoroughly with dilute HCl. In carrying out the carburizing process on $BaCO_3$-coated steel objects, the presence of a small amount of K_2CO_3 in the charcoal or in the coating may interfere with the carburizing reaction in some unknown manner. Apparatus is diagrammed; data are tabulated.

4000* Automatic Control of Gas-Fired Heat Treatment Furnaces. Leo Walter. *Machinery* (London), v. 80, Feb. 14, 1952, p. 284-287.

Describes process-cycle control which enables heat treatments to be carried out in accordance with a predetermined time-temperature curve, for example, with a gradually rising temperature, followed by soaking, and a cooling period. The relative lengths of these periods can be varied at will, according to requirements.

4001* Metallography and Modern Heat Treatments of Special Steels. (In French.) André Michel. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 853-855, 857, 859-861, 871.

Discusses isothermal annealing, interrupted quenching, austempering, subzero treatment, tempering, stabilization by aging, and thermal stress relief. Includes diagrams and tables.

4002 Induction Heating for Continuous Heat Treatment of Sheet and Strip. F. C. Hull and Howard Scott. *Metal Progress*, v. 62, Feb. 1952, p. 57-61.

Discusses the results of investigations on the above. Materials studied were low-carbon steel, 70-30 brass, 18-8 stainless steel, and Al alloys.

4003 Continuous Furnace for Fast Annealing of Tin-Plate. M. D. Stone and E. A. Randich. *Metal Progress*, v. 62, Feb. 1952, p. 62-66.

Presents results of an investigation on the above. Heat treatment furnace is described and diagramed.

4004* Soft Annealing of High-Carbon Steels With Isothermal Transformation. (In German.) Walter Hulsbruch and Erich Theis. *Stahl und Eisen*, v. 72, Jan. 31, 1952, p. 123-131; disc., p. 131-133.

Describes a method for the above designed to yield a uniformly annealed structure with purely spherical cementite in steels. Reports tests on steel with varying amounts of Cr to determine effects of annealing temperature, annealing time, and rate of cooling. Considers economic and furnace-design problems. Tables, graphs, and micrographs.

See also:
3900 (heat transfer in heat treatment of steel)
3917 (heat treating Be-Cu wire)
4007 (heat-treating high tensile steels)
4076 (Titanium alloys)
4087 (aging of Al + 7% Mg alloy)
4156 (effects of heat treatment on rail steel)
4158 (heat-treatment vs. rail defects)
4161 (heat treatment of Ti and alloy)
4193 (heat treatment of Ti)
4405 (patenting of carbon and alloy-steel spring wire)
4411 (heat treatment of turbine blades)

9. CLEANING, FINISHING, AND COATINGS—METALLIC

4005* Absolute Determination of the Condensation Factors of Molecular Jets of Antimony on a Surface. (In French.) Marcel Devienne. *Comptes Rendus hebdomadaires des Seances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 80-81.

The above was determined on the basis of the relation between the value of the radioactivity of a thin layer of Cu on a condensation plate and the sum of the radioactivity of this deposit and condensations on the lateral surface of a metallic cylinder and on a reflection plate. Includes diagram.

4006* Intervention of Specificity in the Formation of Metallic Deposits on Glass. (In French.) Jean Loiseleur. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 162-164.

Formation of a metallic deposit on glass was found to require previous preparation of the surface, consisting in formation of a monomolecular layer by treatment with a very dilute solution of the metal to be deposited. The presence of this layer is said to impose a specificity comparable to the adaptation of an antibody to its antigen. That is, a deposit of a particular metal cannot usually be formed if the surface treatment was with a solution of a different metal. Results for Cu, Au, and Rb are tabulated.

4007* Plating High-Tensile Steels; Some Notes on Methods of Pre-Treatment and Electrodeposition. H. Cann and H. F. Henley. *Aircraft Production*, v. 14, Mar. 1952, p. 87-88.

Discussion on the above includes mechanical and chemical methods of scale-removal, techniques on selective plating, and heat treatment after plating.

4008* Determination of the Electrical Characteristics of the Anodic Oxide Film on Aluminum. (In Italian.) W. Ruff. *Alluminio*, v. 20, Dec. 1951, p. 540-552.

Describes and gives circuit diagrams of an apparatus developed to determine the current present just before perforation of the film. It was found that electrical behavior is not improved by increased oxidation time; that advantages of sealing with Ni and Co acetate appear only after 1 mo., and require an oxidation time of at least 25 min.; and that the sealing effect varies with composition of the Al and is better in 19%-Al soft sheets than in hardened ones. Data are charted and tabulated. 11 ref.

4009 Spray and Sinter to Make High Temperature Alloy Parts. James E. Cline, Robert T. Thurston, and John Wulff. *American Machinist*, v. 96, Mar. 3, 1952, p. 172-175.

Describes a technique by which thin-walled bodies of rotational symmetry impossible to produce by other means can be produced by metal spraying, followed by sintering in a reduced atmosphere.

4010* Electrolytic Polishing: A Process for Treating Stainless Steels and Irons. *Automobile Engineer*, v. 42, Feb. 1952, p. 56.

Describes the Electropol process. In this process, the work is the anode. When current is passed, metal is removed from the outer surface of the work. Applications are briefly discussed.

4011 How to Save Nickel in an Enamel Plant by Lengthening Bath Life. *Ceramic Industry*, v. 58, Mar. 1952, p. 61.

Shows that converting colloidal iron created in the nickel dip to particles of suitable size for filtering prolongs bath life. Claims that this process will save thousands of dollars annually in many enameling plants.

4012* Chromium Plating; Development and Commercialisation of the Process. Part II. The Chromium Plating Solution. *Electroplating and Metal Finishing*, v. 5, Feb. 1952, p. 47-49.

Discusses possibilities for development of radically different types of solution based on chromous, chromic, or complex Cr compounds.

4013* Zinc Spraying: Technique and Applications in France. F. Hedde. *Electroplating and Metal Finishing*, v. 5, Feb. 1952, p. 71-72. (Condensed from article in *Bulletin de Documentation Technique*, Feb. 1951.)

Describes a post-spraying technique, typical metallizing costs, and applications of Zn spraying made in certain branches of French industry. Only the wire pistol is dealt with. The principal physical characteristics of sprayed Zn coatings are summarized.

4014* Application of Dilatometric Analysis to the Problem of Enamelling Cast Iron. Auguste Le Thomas and Pierre Tyvaert. *Foundry Trade Journal*, v. 92, Feb. 7, 1952, p. 151-155.

Reports recent investigations. It is shown that, in borderline cases, selection of enamels with suitable expansion ranges, as revealed by the tests described, may make the difference between success and failure of the coating.

4015 Savings by the Barrel. Charles O. Furbish. *General Electric Review*, v. 55, Mar. 1952, p. 40-43.

Evaluates and discusses the tumbling process for deburring, smoothing, shaping and other surface finishing operations.

4016 Ultrasonic Cleaning of Small Parts. George E. Henry. *General Electric Review*, v. 55, Mar. 1952, p. 60-61.

Discusses a method of removing oil, grease, chips, dirt, lapping compounds, and many other contaminants from the surfaces of small precision work pieces at a rate hitherto unattainable, and to a degree of cleanliness that usually surpasses the most stringent industrial standards.

4017* Putting a High Class Finish on Aluminum Castings. Seymour C. Rubenstein. *Industrial Finishing*, July 1951, p. 50-52.

Describes a method of finishing Al castings. All operations stress light coats of paint and long air drying periods.

4018* Laminated Aluminum Finish Replaces Nickel-Chrome. W. A. Bartski. *Industrial Finishing*, v. 27, Aug. 1951, p. 44-46, 48.

Describes development of a smooth, lustrous, light-silver gray metallic finish that will adhere perfectly to metal surfaces and which has good durability. It is suitable for many protective and decorative uses, including the above.

4019* Finish Line for Magnesium Products. Gilbert C. Close. *Industrial Finishing*, v. 27, Oct. 1952, p. 26-28, 30, 32, 34.

Discusses special problems that come up when using protective coatings on magnesium die castings and the pre-treatment needed to prevent oxidation of the surface.

4020* Cleaning and Preparing Metal Surfaces for the Application of Modern Paint Coatings. P. C. Bardin. *Industrial Finishing*, v. 28, Nov. 1951, p. 18-20, 22, 24, 26, 33-34, 36, 38, 40, 42, 44, 46.

Above discussion includes alkali cleaning and how it is used; acid-solution cleaning, various cleaning solvents, thermal degreasing in burn-off ovens, steam cleaning, and blast cleaning.

4021 The Structure of Sputtered Silver Films. C. E. Ells and G. D. Scott. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 31-34.

The above was studied with the electron microscope, and their structure and physical properties correlated with data available for evaporated films. A possible explanation for the results is proposed. 18 ref.

4022 Electron Diffraction Evidence for the Existence of Microstress in Evaporated Metal Films. Eber K. Halteman. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 150-151.

Line broadening in electron-diffraction powder patterns from evaporated Ni films was investigated. The pure diffraction broadening was found to vary with Bragg angle in agreement with a microstress theory of broadening rather than with a particle-size mechanism. The Fourier transform of pure diffraction broadening was determined and also found to be in agreement with a microstress mechanism.

4023 Tentative Analytical Tests for Phosphate Coatings on Steel. R. St. J. Preston, R. H. Settle, and J. B. L. Worthington. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 19-20.

Details of laboratory tests to determine the nature and uniformity of phosphate coatings are given. The tests consist of the measurement of moisture content, absorption, coating weight, hygroscopicity, and phosphate and chromate contents of the coatings.

4024 Phosphate Coatings as a Basis for Painting Steel. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 10-15.

Describes results obtained when analytical and performance tests were applied to industrial phosphate coatings.

4025 Nickel Plating by Chemical Reduction. I. Effect of the Basis Metal. Robert A. Powers and Norman Hackerman. *Journal of Physical Chemistry*, v. 56, Feb. 1952, p. 187-188.

It is shown that surface configuration of the supporting substance is not of major importance in inducing Ni deposition by chemical reduction either through a similarity to the Ni lattice or through catalytic activity due to surface geometry. Evaporated films of Ni, Fe, Au, Cu, and Pt were prepared by evaporation from a heated tungsten filament and condensation onto glass microscope slides in a chamber evacuated to 5×10^{-5} mm.

4026 New Aluminum Art Technique. *Light Metal Age*, Feb. 1952, p. 18-20.

Discusses and illustrates a new art technique with Al introduced by Nikos Bel-Jon, a San Francisco artist. It promises to greatly expand the application of Al in the field of decoration. High-purity Al sheet is first treated with dilute acid to produce a "frosty" finish. From a drawing of the desired mural, an outline is traced on the metal. After masking certain areas, the material is scratched with steel wool or other abrasives. When colored lights are directed at the murals, an illusion of iridescence is produced. The effect can be varied in many ways.

4027 Hard Surfacing Light Alloy by Anodizing. *Light Metals*, v. 15, Feb. 1952, p. 46-48. (Based on paper by W. J. Campbell.)

Describes the "Hardas" process for Al alloys and gives production information, uses, and mechanical and physical properties.

4028 Some Further Observations on the Painting of Aluminum Alloys. W. A. Edwards. *Light Metals*, v. 15, Feb. 1952, p. 61-63.

Discusses and presents results of exterior exposure tests on the above with respect to weathering and corrosion.

4029* Hardfacing With Stellite. *Machinery* (London), v. 80, Jan. 31, 1952, p. 179-188.

Discusses methods employed by Deloro Stellite, Ltd., Birmingham, England. Applications are given in detail.

4030* Metal Fabrication by Electroforming. Alan Whittaker. *Machinery* (London), v. 80, Feb. 7, 1952, p. 240-242.

The above was studied under the following various stages involved: master-pattern-material selection, surface treatment of master, electrodeposition, and finishing.

4031* Phosphate Coating v. Galvanising. John H. Lawrence. *Machinery Lloyd* (Overseas Ed.)v. 24, Feb. 16, 1952, p. 105-106.

Discusses comparative values for the above obtained by salt-spray and actual weathering tests. Impact and distortion tests were also made. Graph presents corrosion-resistance data.

4032 Recent Developments in Applied Finishes for Aluminium. A. W. Brace. *Metal Industry*, v. 80, Feb. 1, 1952, p. 91-93.

Above discussion includes polishing, anodizing, electroplating, paint finishes, and vitreous enamel finishes. 20 ref.

4033 Pickling and Pickling Acid Inhibitors: Functions, Behaviour and Applications. Alfred Douty. *Metal Industry*, v. 80, Feb. 8, 1952, p. 108-110.

Discusses pickling inhibition and control, includes notes on the mechanism of inhibition. 15 ref.

4034 The Coating of Steel With Aluminum. D. P. Moses, and G. G. Popham. *Metallurgia*, v. 45, Feb. 1952, p. 70-74, 84.

Reviews principal methods for application of Al coatings to steel. Micrographs. 32 ref.

4035 The Protection of Metallic Surfaces by Chromium Diffusion. Part VII. Applications of Chromising. (Concluded.) R. L. Samuel and N. A. Lockington. *Metal Treatment and Drop Forging*, Feb. 1952, p. 81-85.

Describes method which can be used to advantage for improving the wear- and abrasion-resistance of drop-forging dies, hand

9. *Cleaning, Finishing, and Coatings—Metallic*

and machine tools, and general purpose tools. Summarizes the present position and future outlook of chromium diffusion and allied processes.

4036 Solid Films on Electropolishing Anodes. T. P. Hoar and T. W. Farthing. *Nature*, v. 169, Feb. 23, 1952, p. 324-325.

Presents evidence of the presence of a solid film (dissolving at its outer service as fast as it is formed anodically from the metal) during the electropolishing of Cu and α-brass anodes in a 50/50 by volume orthophosphoric acid water bath.

4037 Observations on the Photoelectric Work Functions and Low Speed Electron Diffraction From Thin Films of Silver on the (100) Face of a Silver Single Crystal. Edward N. Clarke and H. E. Farnsworth. *Physical Review*, ser. 2, v. 85, Feb. 1, 1952, p. 484-485.

The above effect was studied; and, in particular, a search was made for a possible change in structure of the deposited film which might be associated with a decrease in photoelectric work function.

4038 Changes in Work Functions of Vacuum Distilled Gold Films. Chung Fu Ying and H. E. Farnsworth. *Physical Review*, ser. 2, v. 85, Feb. 1, 1952, p. 484-486.

Results appear to indicate that the gold film deposited on a surface at room temperature possesses some structural characteristics different from that of polycrystalline bulk gold and that the structure of the film approaches that of the bulk when the temperature of the film is raised.

4039 Tentative Recommended Practice for Preparation of and Plating on Aluminum Alloys. *Plating*, v. 39, Mar. 1952, p. 265-266.

(To be continued.)

4040 Waste Treatment Layout for a Job Plating Shop; A Case History. Leslie E. Lancy, and H. F. Hanson. *Plating*, v. 39, Mar. 1952, p. 250-254.

4041 Some Characteristics of Zinc Cyanide Plating Solutions. II. Haring Cell Throwing Power. Gustaf Soderberg. *Plating*, v. 39, Mar. 1952, p. 255-256, 260.

Discusses and presents results of the above investigation.

4042 Barrel Finishing. II. Selection of Equipment. Morris S. Shipley. *Plating*, v. 39, Mar. 1952, p. 257-260.

Discusses points to consider in equipping a barrel-finishing department for efficient operation.

4043 The Hot-Dip Galvanizing of Structural Steel Sections. R. A. Painter. *Proceedings of Institution of Electrical Engineers*, v. 99, pt. 2, Feb. 1952, p. 39-46.

Presents a brief description of the metallurgical structure of a Zn coating, together with some information on its expected life. Presents a condensed description of the process, and of certain methods of quality control; and advises on maintenance of the finished product.

4044 Phosphate Coatings for Military Products. Norman P. Gentieu. *Product Engineering*, v. 23, Feb. 1952, p. 183-190.

A review of the types of phosphate coatings being specified by the armed services for protection of metal surfaces. Tabulated list of specifications. (To be continued.)

4045* Bright Dipping Brass Compacts. Marvin Rubinstein. *Products Finishing*, v. 16, Feb. 1952, p. 34-40, 42, 44, 46, 48.

Presents a summary of procedures for the above.

4046* Spotlighting Finishing Progress; Properties of Chromium Plate. Allen G. Gray. *Products Finishing*, v. 16, Feb. 1952, p. 54, 56, 58, 62, 64, 68, 70, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92.

Reviews recent work on the following topics: properties of Cr plate; factors affecting the quality of lacquer coatings, pickling and etching Al alloys, and mechanical finishing of Mg parts.

4047* Recovery of Chromic Acid From Plating Operations. F. R. Keller, C. C. Cupps, and R. E. Shaw. *Sewage and Industrial Wastes*, v. 24, Feb. 1952, p. 202-206; disc., p. 206.

Describes installation of a recovery system at Standard Steel Spring Company, Newton Falls, Ohio. Flow diagram shows plating cycle as altered to recover chromic acid, showing designed flow rates and equilibrium concentration of CrO_3.

4048* The Plating Wastes Problem From the Electroplater's Viewpoint. A. K. Graham and H. L. Pinkerton. *Sewage and Industrial Wastes*, v. 24, Feb. 1952, p. 207-210; disc., p. 210-211.

An attempt is made to define the electroplating industry and the nature of plating wastes. A distinction is made between plants discharging waste into public waters and into municipal sewers, and the problems related thereto are briefly discussed. The interdependence of the sanitary engineer and electroplating engineer, for successful handling of plating waste problems, is emphasized.

4048a* A Theory of the Mechanism of the Formation of Zinc Coatings During Galvanizing. H. Bablik, F. Götzl, and R. Kukaczka. *Sheet Metal Industries*, v. 29, Feb. 1952, p. 173-174.

Presents the above which attempts to prove that the influence of chemical additions to the iron also result in a disturbance of the base metal, that is, by increasing the area of the reacting surface.

4049* Alternatives to Nickel-Chromium Plating; Report on Contributions to Birmingham Meeting of the Institute of Metal Finishing. *Sheet Metal Industries*, v. 29, Feb. 1952, p. 175-177.

The subjects discussed fell under four main heads, bright Zn plating, Cr on Cu, Sn-alloy plating, and colorless lacquers as plating reinforcements.

4050 Smooth Finish for Strip; Moving Abrasive Produces It. S. L. Johnson and R. G. Hall. *Steel*, v. 130, Mar. 3, 1952, p. 82-83.

Tells how coated abrasive paper progressively fed over moving steel strip produces variety of finishes, cleans, and scours the surface evenly on both sides simultaneously.

4051* Metallizing a Viaduct. W. C. Henzlik. *Welding Engineer*, v. 37, Mar. 1952, p. 40-42.

Describes process whereby sprayed Al is given an overcoating of a special Al vinyl plastic to provide 20-50 yrs. of corrosion protection for newly built steel bridges and viaducts.

4052* Crusher Parts Made Tougher by Hard Facing Using Submerged Arc Welding. *Welding Journal*, v. 31, Feb. 1952, p. 152.

Describes and illustrates procedures used by Finning Tractor and Equipment Co., Ltd., Vancouver, B. C., in rebuilding Mn-steel crusher cones and mantles.

4053 Automatic Hardfacing. M. Riddihough. *Welding and Metal Fabrication*, v. 20, Feb. 1952, p. 61-62.

Discusses the submerged-arc process for fabrication purposes and for rebuilding and hardfacing of such components as steel-mill roll journals and rolls, straightening and table rolls, caterpillar-track rollers and idlers, gyratory crusher cones, etc. 13 ref.

4054* Rust Protection (In Industrial Coating Practice). (In German.) Otto Gerhardt. *Werkstoffe und Korrosion*, v. 2, Dec. 1951, p. 444-446.

Points out the great need for renewing the paint on weather-exposed iron and steel structures in Germany, discusses various passivating undercoatings and topcoats, properties of suitable pigment binders, and the most recent development in silicone and fluoro-hydrocarbon coatings.

4055* Renewing Bearing Surfaces; Electrolytic Iron Saves Critical Parts. R. S. Trent. *Western Machinery and Steel World*, v. 43, Feb. 1952, p. 104-107.

Describes Vanderloy M, an electrolytic iron and Porus-Krome, a glass-smooth, diamond-hand plating that retains oil. Processes involved are discussed. Micrographs.

4056 South American Wire Galvanising Plant. *Wire Industry*, v. 19, Feb. 1952, p. 135-138.

Describes production at an unidentified plant; surveys the situation and makes suggestions for improving technique.

See also:
3917 (plating Be-Cu wire)
3974 ("Raco 220," a non-abrasive cleaner for Al)
4084 (deposition of thin Cu layers)
4102 (diffusion of Cu and Mg in Al-alloy electro-deposits)
4180 (elastic constants of electrodeposited Cr)
4194 (hard-facing methods and alloys)
4222 (phosphated steel—corrosion by retained chemicals)
4409 (surface finishing of plow moldboards)
4732 (metallic coatings for fluorocarbon polymers)

10. METALLOGRAPHY AND PRIMARY STRUCTURES

4057* Nitriding of Columbium. (In French.) Albert Septier, Maurice Gauzit, and Pierre Baruch. *Comptes Rendus hebdomadaires des Séances de l'Academie des Sciences*, v. 234, Jan. 2, 1952, p. 105-107.

A columbium nitride wire was studied under the electron microscope, and probable existence of a subnitride discussed. The new method of observation increases the possibilities of using the emission microscope in metallography. Method of preparation of the wire is also described. Includes micrographs.

4058* Chemical Polishing of Iron and Soft Steel. (In French.) Louis Beaujard. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 21, 1952, p. 440-442.

A solution suitable for chemical polishing of soft steels containing less than 0.05% C is described. It consists of 30 parts HNO_3, 70 parts HF, and 300 parts water. Temperature recommended is 60° C. Includes photomicrograph and diagram.

4059* Crystal Chemical Studies of the 5f-Series of Elements. XV. The Crystal Structure of Plutonium Sesquicarbide. XVI. Identification and Crystal Structure of Protactinium Metal and of Protactinium Monoxide. (In English.) W. H. Zachariasen. *Acta Crystallographica*, v. 5, Jan. 1952, p. 17-21.

Presents interpretation of diffraction data on the above.

4060* The Structure of an α/β Brass. (In English.) R. J. Davis, R. Pearce, and W. Hume-Rothery. *Acta Crystallographica*, v. 5, Jan. 1952, p. 36-38.

A detailed examination of the structure of an α/β brass is described. In the annealed state, ordinary etching methods reveal small angular crystals of the α phase embedded in large crystals of β. Careful electrolytic polishing and etching show that the large β crystals are in reality colonies of much smaller grains. The effect of annealing on the form of the α and β crystals is described, and the reasons for the formation of the β substructure are discussed. Micrographs.

4061* The Structure of Alloys of Lead and Thallium. (In English.) You-Chi Tang and Linus Pauling. *Acta Crystallographica*, v. 5, Jan. 1952, p. 39-44.

Alloys of Pb and Tl have a structure based upon cubic closest packing from 0 to about 87.5 at. % Tl. Variation of the lattice constant with composition gives strong indication that ordered structures $PbTl_3$ and $PbTl_7$ exist. A theory of the structure of the alloys is presented. 12 ref.

4062* The Structure of $TiBe_{12}$. (In English.) R. F. Raeuchle and R. E. Rundle. *Acta Crystallographica*, v. 5, Jan. 1952, p. 85-93.

Presents results of an investigation on the above. The structure seems to involve a not quite fully ordered super-lattice, and it seems possible that the nature of the disorder may yet become understandable.

4063* Submicroscopic Structure of "Magnico" Alloy. (In Russian.) N. N. Buinov and V. V. Kliushin. *Doklady Akademiii Nauk SSSR*, new ser., v. 80, Oct. 11, 1951, p. 739-742.

An alloy containing 50% Fe, 24% Co, 14% Ni, 9% Al, and 3% Cu was investigated. Replicas for electron microscopy were made by an oxidation method and by a single-step quartz method. Includes micrographs at 7000, 21,000, and 51,000 magnification.

4064* The Structure of $AlAu_4$. (In Russian.) V. G. Kuznetsov and V. I. Rabezova. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 1, 1951, p. 51-54.

X-ray and microscopic studies were made of Au-Al alloys containing 96.75 and 96.65 wt. % Au. Data are discussed, tabulated, and charted.

4065* A Method of Representing Quintuple and More Complex Metallic Systems. (In Russian.) I. I. Kornilov. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 11, 1951, p. 191-194.

A system for the graphical representation of equilibria in specific regions of complex metallic systems was developed. Examples are illustrated and explained.

4066* New Intermetallic Compounds in the Fe-Mo Binary System. (In Russian.) R. P. Zaletaeva, N. F. Lashko, M. D. Nesterova, and S. A. Iuganova. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 21, 1951, p. 415-416.

A new compound was found in a molybdenum steel (0.1% C, 16% Cr, 25% Ni, 6% Mo). X-rays showed this compound to be Fe_2Mo. Its structure was the same as previously observed for Fe_2W. Data are discussed and tabulated.

4067* Solid Solutions of Metallic Compounds. (In Russian.) I. I. Kornilov. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 597-600.

Types of intermetallic compounds are described and conditions of forming solid solutions among these compounds are discussed. Numerous examples are cited. 13 ref.

4068* The Ni-Si Constitution Diagram. (In Russian.) N. F. Lashko. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 605-607.

Microstructure and lattice dimensions of Ni-Si alloys containing 2, 4, and 7% Si were studied. Results are tabulated and illustrated.

4069* Research on Cobalt-Beryllium Alloys. (In Italian.) G. Venturello and A. Burdese. *Alluminio*, v. 20, Dec. 1951, p. 558-564.

The Co-Be system was studied by X-ray, micrographic, and thermal-analysis methods. Two intermetallic compounds were found: Co-Be and Co_2Be_{21}, both cubic. Refers to effects of heat treatment on alloys containing 1.56, 1.87, and 2.10% Be. Data are tabulated and charted. Includes micrographs and radiation patterns. 10 ref.

4070 Preferred Grain Orientation in Steel Castings. J. D. Lavender and J. I. Morley. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 26-28.

The above is considered in relation to the allotropic transformations that occur during cooling. Where these transformations occur at very high temperatures, of the order of 1300°C., as in certain stainless steels, the crystallographic orientation of the primary dendrites is preserved at room temperature, and columnar-grained castings will then be subject to elastic anisotropy. Where they occur at temperatures of 700°C. and below, as in mild steel, a random orientation is developed during recrystallization, and a test on a columnar-grained specimen of mild steel suggests that such castings will be elastically isotropic.

4071 A Microscopical Examination of Iron Containing Manganous Inclusions. R. E. Lismer and F. B. Pickering. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 48-50.

Samples of 3 ingots containing inclusions of varied MnO content were examined under normal vertical illumination, under polarized light, after application of Whiteley's tests, and after acid tests. Optical and chemical characteristics of the inclusions were determined.

4072 X-Ray Measurement of Order in CuPt. C. B. Walker. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 118-123.

In investigating the order-disorder transformations in CuPt, cell parameters were determined from specimens quenched at intervals from 25-890°C. The rhombohedral deformation of the ordered, layered structure was found to diminish with increasing temperature, disappearing at a critical temperature of 815°C. Cold working an ordered sample was found to trans-

10. *Metallography and Primary Structures*

form the alloy almost completely from the ordered rhombohedral cell to the disordered cubic cell.

4073 Influence of Carbon on the Lattice Parameter of Molybdenum. Rudolph Speiser, J. W. Spretnak, W. E. Few, and R. M. Parke. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 275-277.

Investigation of the above was undertaken because of the known fact that interstitial carbon may cause intergranular brittleness in Mo. Various heat treatments, C analyses, and X-ray measurements were conducted. Results show that C dissolves interstitially in Mo resulting in linear expansion of lattice parameter with increase of C in solid solution. Geometrical consideration of the relationship of C-atom size to size of interstice approximately predicts the observed volume expansion. 12 ref.

4074 Zirconium-Chromium Phase Diagram. E. T. Hayes, A. H. Roberson, and M. H. Davies. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 304-306.

Presents details of a cooperative project between the Bureau of Mines and Air Material Command. The Zr-Cr system was investigated in the range 0-53% Cr to determine possibilities of improving corrosion resistance and mechanical properties of Zr in a manner similar to the enhancement of the properties of Ti by additions of Cr. Phase diagrams and photomicrographs.

4075 The X-Ray Diffraction Study of Single Crystals of Lead. Y. C. Chuang. *Metallurgia*, v. 45, Feb. 1952, p. 99-101.

Describes a method by which lead single crystals can be produced. The orientation of the crystal was determined by the back-reflection Laue method. Photographs.

4076 The Titanium Alloys Today. Walter L. Finlay and Milton B. Vordahl. *Metal Progress*, v. 61, Feb. 1952, p. 73-78.

Presents an over-all view of the above. Discusses the differences between α and β alloys. Some mechanical properties of these alloys are given and heat treatment practices are briefly surveyed. Micrographs.

4077 Solubility of Magnesium in Lithium. J. A. Catterall. *Nature*, v. 169, Feb. 23, 1952, p. 336.

The phase diagram of Mg in Li has been well established except for the solid solubility of Mg in Li. Briefly discusses, and presents a diagram establishing this boundary by microscopical examination of alloys annealed and quenched at various temperatures.

4078* Heat-Resistant Cast Steel. (In German.) H. Lüling. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 18, Jan. 1952, p. 22-32.

Describes results of experiments on effect of carbon, various alloying elements, and heat treatment on structure and mechanical properties of the above. Macrographs, micrographs, photographs, tables, and graphs are presented. 22 ref.

4079* Ferrite-Grain-Size Measurements for Ship Plate Steel. J. E. Campbell, R. H. Frazier, and H. O. McIntire. *Welding Journal*, v. 31, Feb. 1952, p. 78s-90s; disc., p. 90s-94s.

Ferrite grain sizes were determined in Class A ship plate in the as-rolled condition and after austenitizing at various temperatures followed by cooling at various cooling rates. Results obtained using intercept methods, grain counting, comparison with a special series of photomicrographs, and a fracture method for rating ferrite grain sizes were compared. Micrographs. 10 ref.

4080* Remarks on the Existence of Molybdenum Carbide. (In German.) H. Nowotny and R. Kieffer. *Zeitschrift fur anorganische und allgemeine Chemie*, v. 267, Jan. 1952, p. 261-264.

Investigation of C-rich Mo carbides reveals, not the cubic-phase centered Mo_2C, but a phase that corresponds more to MoC with slight carbon deficiency. 11 ref.

Miscellaneous Publications

4081 Survey of the Chromium-Cobalt-Nickel Phase Diagram at 1200°C. W. D. Manly and Paul A. Beck. National Advisory Committee for Aeronautics, Technical Note 2602, Feb. 1952, 45 pages. (TL570 Un3t)

The above was made by means of microscopic and X-ray diffraction studies on 110 vacuum-melted alloys prepared from commercial metals of the highest purity available. Tables, graphs, and micrographs.

4082 Survey of Portions of the Cobalt-Chromium-Iron-Nickel Quaternary System. E. L. Kamen and Paul A. Beck. National Advisory Committee for Aeronautics, Technical Note 2603, Feb. 1952, 62 pages. (TL570 Un3t)

An isothermal survey was made of the above. The Fe content was varied up to 30% to include the range of commercial Cr-Co-Ni alloys. Tables, graphs, and micrographs. 14 ref.

See also:

3807 (Fe-FeS-FeO system)
3838 (inclusions in stainless and alloy steels)
3952 (Cu tellurides)
4021 (structure of sputtered Ag films)
4022 (diffraction patterns of Ni films)
4043 (microstructure of hot-dip Zn coatings)
4083 (P and As segregates in alloy steels)
4085 (growth spirals on Au crystals)
4107 (Ti-Mo alloys)
4108 (metallography of Mo)
4109 (martensitic structure—volume relations)
4173 (metallography of Mg-Th alloys)
4188 (microstructures of Mg alloys)
4290 (nonmetallic inclusions in steel)

11. METALS—TRANSFORMATIONS AND RESULTING STRUCTURES

4083* Study of the Homogenization of Dendritic Segregates of Phosphorous and Arsenic in Alloy Steels. (In French.) André Kohn. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Dec. 19, 1951, p. 1617-1619.

Shows that diffusion of phosphorous in steels occurs more rapidly than that of arsenic, and that it does not appear to be influenced very much by the presence of alloying elements generally encountered. Includes micrographs.

4084* Recrystallization of Thin Layers of Copper; Experimental Results. (In French.) Antoine Colombani and Gaston Ranc. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 78-80.

Thin layers of Cu were deposited by thermal evaporation on plexiglas and NaCl supports. Includes diagrams and graphs. Thickness and structure of the deposits were studied.

4085* Growth Spirals on Gold Crystals Obtained by Precipitation. (In French.) Séverin Amelinckx, Carl C. Grosjean, and Willy Dekeyser. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 113-115.

The above was studied with respect to the theory of Frank which states that crystal growth occurs, in the case where supersaturation is small, by the joining of growth units along the exposed edge created by the formation of one or several helicoidal dislocations on one of the sides of the primary nucleus. Includes photograph and diagram.

4086* Magnetic Study of Martensitic Transformations Produced by Working or by Heating of Steels Containing 18% Chromium and 4 to 12% Nickel. (In French.) Paul Bastien and Jacques Dedieu. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 14, 1952, p. 334-336.

Results of study of the above are summarized.

4087* X-Ray Study of the Aging of an Aluminum-Magnesium Alloy Containing 7% Magnesium. (In French.) Adrienne R. Weill. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 28, 1952, p. 523-525; disc., p. 525-526.

When the tempering at 160 or 250°C. of above alloys is accompanied by the formation of Mg-rich precipitates, after 6 months at 55°C., one can detect by X-rays a strongly stressed state of the lattice, which was not noticeable at higher tem-

peratures before the appearance of precipitates. Includes micrographs and discussion by Pierre Chevenard.

4088* The Question of the Intermediate Transformation of Austenite. (In Russian.) R. I. Entin. *Doklady Akademii Nauk SSSR*, new ser., v. 79, Aug. 21, 1951, p. 973-976.

The mechanism of the decomposition of austenite in the range 450-600°C. is discussed. The influence of C, Ni, Cr, W, Mo, and Mn on variation of the mechanism is described.

4089* The Influence of Carbon on the Self-Diffusion of Iron. (In Russian.) P. L. Gruzin, Iu. V. Kornev, and G. V. Kurdiumov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 1, 1951, p. 49-51.

Radioactive Fe^{59} was used to study the self-diffusion of Fe in various steels. Data are discussed, tabulated, and charted.

4090* Certain Regularities of Diffusion and Mechanical Properties of Metals. (In Russian.) I. Ia. Dekhtiar. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct., 21, 1951, p. 875-878.

The theory of rate processes is applied to self-diffusion and creep strength of Cu, Al, steel, Pb, and Sn. Data are discussed, tabulated, and charted.

4091* Thermodynamic Interpretation of Aging Phenomena in Alloys. (In Russian.) L. S. Palatnik. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 1, 1951, p. 39-42.

The aging of alloys is explained from a thermodynamic standpoint. Results are discussed in relation to experimental data. Data are charted.

4092* "Diffusion" Supercooling During Crystallization of Binary Alloys." (In Russian.) G. P. Ivantsov. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 11, 1951, p. 179-182.

By theoretical considerations it is shown that a layer of supercooled liquid is formed at the crystallization front even if equilibrium conditions are maintained. Results are discussed and charted.

4093* Kinetics of the Martensite Transformation at Temperatures Above Room Temperature. (In Russian.) G. V. Kurdiumov and O. P. Maksimova. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 565-568.

The martensite transformation in a steel containing 0.8%C and 2.2%Mn was studied at temperatures from −196 to +155°C. Data are discussed and charted.

4094* The Question of the Influence of Deformation on the Kinetics of the Martensite Transformation. (In Russian.) O. P. Maksimova and A. I. Nikonorova. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 11, 1951, p. 183-186.

The effect of temperature and amount of deformation on the martensite transformation was studied for various Ni and Mn steels. Data are discussed and charted.

4095* Investigation of the Solidification of Steel. I. Theoretical Principles. (In Czech.) Nickolaj Chvorinov. *Hutnické Listy*, v. 6, Nov. 1951, p. 549-552; Dec. 1951, p. 594-598.

The solidification of steel is considered from a theoretical point of view. A series of factors are not included because of the lack of experimental data. A complicated method is suggested for further study of the problem.

4096 Diffusion in Indium Near the Melting Point. Roger E. Eckert and H. G. Drickamer. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 13-17.

Diffusion coefficients for the systems Tl^{204}–In and In^{115}–In were measured in the solid state and in the neighborhood of the melting point. The measurements were made in both polycrystalline masses and in single crystals.

4097 Effect of Alloying Elements on the Breakdown of Austenite at Sub-Zero Temperatures. Part I. J. O. Ward, M. D. Jepson, and J. R. Rait. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 1-9.

In the preliminary experiments, using a 1%-C, 0.3%-Mn base material, up to 3-4% of Mn, Cr, and Ni were added separately. The amount of subzero transformation was increased by Mn and Ni; but, although increasing at first upon addition of Cr, fell off at more than 1% Cr. 16 ref.

4098 Distribution of Hydrogen in Large Ingots and Forgings. J. D. Hobson and C. Sykes. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 118-122.

The above was investigated. It is shown that severe segregation occurs, and persists in finished forgings. The variation found depends upon the size of sample, being much more severe with small specimens. Re-hydrogenation experiments demonstrate that segregation is not caused by variable hydrogen solubility. Some practical implications of the results are considered. Data are tabulated.

4099 The Effect of Neutron Irradiation on Metallic Diffusion. T. H. Blewitt and R. R. Coltman. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 384.

Describes the above in Cu_3Au samples.

4100* Ageing Phenomena in Iron and Steel After Rapid Cooling. J. D. Fast. *Philips Technical Review*, v. 13, Dec. 1951, p. 165-171.

Includes internal structure of Fe and Fe alloys; solubility of Mn, C, N_2, and O_2 in α-iron; nucleation; diffusion; precipitation, and quench ageing as determined by hardness measurements.

4101* Study of the Phenomena of Recrystallization by Electron Microscopy. (In French.) G. W. Rathenau. *Revue de Métallurgie*, Dec. 1951, p. 923-928; disc., p. 928.

Phenomena of recrystallization and grain growth in cold-rolled, face-centered NiFe crystals were investigated. Results are illustrated.

4102* Spectrographic Study of the Diffusion of Copper and of Magnesium in Electrodeposited Al-Cu-Mg and Al-Zn-Mg-Cu Alloys. (In French.) Martial Renouard. *Revue de Métallurgie*, Dec. 1951, p. 944-955; disc., p. 955-956.

First, presents theoretical, mathematical analysis of the above phenomenon. Then describes experimental procedures, results, and their interpretation. The alloys studied are Al-base. Data are charted and tabulated.

4103* A Method of Studying Changes of Phase at High Temperatures by Means of X-Rays. (In French.) H. T. Heal and H. Mykura. *Revue de Métallurgie*, Dec. 1951, p. 966-969.

Describes a method for the above in which a Geiger-Muller counter is used to measure the total intensity of a diffraction line emanating from any phase; and in which the counting cadence, registered electronically, indicates the proportion present of the phase in question. Application to transformations of a low-alloy steel is described. Graphs and diagram.

4104* Thermoelectric Study of the Recrystallization of Cu-Zn Alloys. (In French.) P. Laurent and M. Eudier. *Revue de Métallurgie*, Dec. 1951, p. 970-974.

Describes a method in which cold-worked wires placed in an oven at a constant temperature and taken out at various times; couples were formed with the annealed wires and their thermoelectric power at low-temperature measured. Compositions studied varied from pure Cu (99.7%) to 70-30 Cu-Zn. Data are charted. 16 ref.

4105 Isothermal Martensite Formation in an Iron-Chromium-Nickel Alloy. S. A. Kulin and G. R. Speich. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 258-263.

The isothermal formation of martensite at subzero temperatures was studied in an austenitic stainless steel. Amount of martensite formed isothermally in a given time was found to follow a C-curve behavior with decreasing temperatures. It is believed that a general martensite theory must include the basic concepts of the strain embryo theory, and also the important role of thermal fluctuations. 12 ref.

4106 Origin of Recrystallization Textures. J. E. Burke. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 263-264.

Discusses various theories of the above. 10 ref.

4107 Time-Temperature-Transformation Characteristics of Titanium-Molybdenum Alloys. D. J. DeLazaro, M. Hansen,

11. *Metals—Transformations and Resulting Structures*

R. E. Riley, and W. Rostoker. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 265-269.

Summarizes, on conventional TTT charts, the isothermal transformation products and pertinent reaction-rate data for binary alloys of Ti containing 1, 3, 5, 7, 9, and 11% Mo, respectively. The results were derived from metallographic examination. X-ray diffraction work was done to clarify certain points of question.

4108 Solubility of Carbon and Oxygen in Molybdenum. W. E. Few and G. K. Manning. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 271-274.

It has been known for some time that both intergranular carbide and intergranular oxide phases cause brittleness in Mo. Hence experiments were made on the above at temperatures up to 4000°F., following heat treatments in various atmospheres. Results are tabulated, charted, and illustrated by photomicrographs.

4109 Relation Between the Volume of Martensite and the Number of Martensitic Plates Per Unit Volume. E. S. Machlin. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 277-278.

Presents mathematical analysis of above problem conducted in an effort to solve the problem of the rate of nucleation during martensitic transformations.

4110 On the Mechanism of Precipitation in Copper-Beryllium Alloys. A. H. Geisler, J. H. Mallery, and F. E. Steigert. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 307-316.

Reconciles existing data on the above with some new data to present a more complete and rational analysis of the atomic rearrangements involved in the process. Two different coherent precipitates were proposed. Each is responsible for a type of diffuse X-ray diffraction effect. 29 ref.

Miscellaneous Publications

4111 Effects of Low-Manganese Pig Iron on Open-Hearth Operations. John A. Hornak. *Proceedings, National Open-Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951 p. 27-42. (TS1 Am350)

Presents a statistical analysis of the above. In general, the quality of the final product was not diminished by any appreciable extent by low-Mn pig iron. Data are graphed.

See also:

3834 (gases in steel)
3871 (nodular-graphite formation in cast iron)
3964 (structural changes in Al-Mg alloys during welding)
4004 (annealing transformation of high-carbon steels)
4069 (transformations of Co-Be alloys)
4070 (allotropic transformations in steels)
4145 (α-γ and reverse transformations of Fe)

12. METALS—PHYSICAL PROPERTIES AND TESTS

4112* Optical Properties of Very Thin Metallic Films. (In French.) Florin Abelés. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 7, 1952, p. 198-199.

Presents results of experiments on a method of determining from measurements of factors of reflection on the air side and the glass side, and from the transmission factors of thin metallic films, the parameters which characterize the above.

4113* Thermal Shock Tests on Gas Turbine Materials. M. Bentele and C. S. Lowthian. *Aircraft Engineering*, v. 24, Feb. 1952, p. 32-38.

Discusses and presents results of a comprehensive study of the effects of severe temperature fluctuations on rotor blades and nozzle segments. Two forms of thermal shock tests are proposed. Materials include high-temperature alloys, ferritic high-temperature steel, copper, and porcelain. 12 ref.

4114* Emissions of Electrons and Reflections of Ions From Metal Surfaces. (In Russian.) M. A. Eremeev. *Doklady Akademii Nauk SSSR*, new ser., v. 74, Aug. 11, 1951, p. 775-777.

A study was made of the above at target temperatures up to 1000°K. Sn, Ca, and Li were bombarded with Ta and W ions. Results are discussed and charted.

4115* The Viscosity of Molten Metals. (In Russian.) G. M. Panchenkov. *Doklady Akademii Nauk SSSR*, new ser., v. 79, Aug. 21, 1951, p. 985-988.

The viscosity of molten metals is shown to have the same temperature dependence as many common liquids, hydrocarbons, water, molten salts, etc. Calculated values are compared with experimental data for Na, K, Ag, Cd, Hg, Sn, Pb, Sb, and Bi.

4116* Influence of Temperature on the Irreversible Electrode Potential of Aluminum. (In Russian.) V. V. Romanov and G. V. Akimov. *Doklady Akademii Nauk SSSR*, new ser., v. 79, Aug. 21, 1951, p. 989-991.

The above was investigated using commercial Al in 1N chloride solutions of pH's 1-13 and at 0-80°C. Data are discussed and charted.

4117* Th Theory of Coercive Forces and Magnetic Susceptibility of Ferromagnetic Powders (Dependence on Density of Packing. (In Russian.) E. Kondorskii. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 11, 1951, p. 197-200.

Presents theoretical, mathematical analysis of the above, with reference to the literature.

4118* The Magnetization of Highly Coercive Ferromagnetic Substances in Weak Fields. (In Russian.) D. I. Volkov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 21, 1951, p. 349-351.

An Fe-Co-V alloy (38% Fe, 52% Co, 10% V) was used to study magnetization in fields from 25 to 345 oersteds. Data are discussed and charted.

4119* Optical Properties of Metallic Alloys. (In Russian.) S. V. Vonsovskii, A. A. Smirnov, and A. V. Sokolov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 21, 1951, p. 353-356.

The optical properties of a series of Ag-Au alloys were investigated. The data were subjected to theoretical analysis. The degree of ordering is shown to be important with regard to optical properties.

4120* Capillary Phenomena During Contact Melting of Crystals. (In Russian.) D. D. Saratovkin and P. A. Savintsev. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 1, 1951, p. 631-633.

The phenomena of contact melting of Sn-Zn, Bi-Sn, Bi-Pb, and Pb-Sb metal pairs was studied experimentally. In each case a globule of one metal was melted by contact with a hot plate or sheet of the other.

4121* The Nature of Elastic Anomalies in Alloys of the Invar and Elinvar Type. (In Russian.) K. P. Belov and O. N. Agasian. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 21, 1951, p. 881-883.

The elastic and ferromagnetic properties of Fe-Ni, Fe-Pt, Fe-Ni-Co, Fe-Ni-Cr, and Fe-Co-Cr alloys were investigated. Results are discussed and charted.

4122* Thermoelectronic Emission From Ferromagnetic Materials. (In Russian.) A. V. Sokolov and A. Z. Veksler. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 1, 1951, p. 27-30.

A theoretical analysis was made of the above effect. In the discussion, this effect is compared with the photo effect in Ni.

4123* Causes of Changes of Magnetic Saturation of Fe-Ni-Al High-Coercive-Strength Alloys During Tempering. (In Russian.) O. S. Ivanov and Iu. M. Kazimirov. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 1, 1951, p. 35-38.

The above was investigated in relation to ordering, various proportions of alloying elements, and electrical resistance. Data are discussed and charted.

4124* Influence of Composition on the Highly Coercive State of Iron-Nickel-Aluminum Alloys. (In Russian.) O. S. Ivanov, Iu. M. Kazimirov, and O. A. Novikova. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 11, 1951, p. 231-234.

In order to determine the best composition for a high-coercive-strength alloy, two series of Fe-Ni-Al alloys were studied experimentally. Data are discussed and charted. 13 ref.

4125* The Dependence of Coercive Force on the Size of Powder Particles of Soft Magnetic Materials. (In Russian.) Ia. S. Shur, T. D. Zotov, and I. A. Chebotarev. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 21, 1951, p. 387-389.

The coercive strength of various sized particles of Alsifer (9.4% Si, 5.3% Al, balance Fe) was determined over the range −195 to 300°C. Results are discussed and charted.

4126* Certain Peculiarities of the Magnetic Properties of Zinc Monocrystals at Low Temperatures. (In Russian.) B. I. Verkin. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 529-532.

The magnetic properties of single crystals of Zn were studied at 1.8-20.4°K. and in magnetic fields of 1500-15,000 oersteds. Data are discussed and charted.

4127* Nearly Square Hysteresis Loops. (In Russian.) M. V. Dekhtiar and L. M. Dekhtiar. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 533-536.

Above were obtained from permalloy (Fe-Ni alloy) wires recrystallized under a tensile load close to the yield point. Data are discussed and charted.

4128* Temperature Variation of Magnetic Hysteresis in Highly Coercive Alloys. (In Russian.) Ia. S. Shur, N. A. Baranova, and V. A. Zaikova. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 557-560.

Above was studied for Alnico (51%Fe, 24%Co, 15%Ni, 8%Al, 3%Cu) samples between 195 and 550°C. Data are discussed and charted.

4129* Electric and Metallic Properties of Metals and Alloys. J. A. Bate. *Australasian Engineer*, Jan. 7, 1952, p. 79-89.

A review of the metallurgical aspects of electrical conductivity, thermoelectricity, and ferromagnetism. 41 ref.

4130 The Spectral Emissivity of Iron-Nickel Alloys. H. B. Wahlin, Robert Zentner, and James Martin. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 107-108.

The above was determined and shows changes with temperature which indicate that, between 1200 and 1600°K., abnormal behaviors exist which hitherto have not been suspected. A correlation of emissivity change with change in density of metals is suggested.

4131 Copper Alloys in the Watch Industry. Watch Frames. Philippe DeCoulon. **Watch Escapements.** Simon-Vermot. **Nickel-Silver Watch Cases.** *Metal Industry*, v. 80, Feb. 15, 1952, p. 127-130.

Discusses the above and presents tabular data on Cu and Ni-Ag alloys covering description, composition, density, expansion, and electrical resistance. Also discusses microstructure and mechanical properties.

4132 Interaction Between the d-Shells in the Transition Metals. IV. The Intrinsic Antiferromagnetic Character of Iron. C. Zener. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 324-328.

The principles developed in the previous papers of this series are applied to interpret the presence of ferromagnetism in b.c.c. iron, its absence in f.c.c. iron. It is found necessary to introduce a new principle, namely that, for minimum energy, the d-shell electrons are distributed among the atoms so as to maximize the total number of pairs of electrons having like spin within the individual atoms. 28 ref.

4133 Theory of Conductivity of Semiconductors. George Jaffé. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 354-363.

In Sec. I, fundamental equations are established in a general way and boundary conditions are discussed. In Sec. II, the general procedure for treating the time-dependent equations is sketched. Subsequently the special case of simple a.c. is treated in detail; and the complete expression for the frequency dependence of the equivalent susceptance and conductance is established. Finally, in Sec. III, the theory is compared with the results of a.c. measurements performed on locally manufactured Se disks.

4134 Neutron Diffraction Investigation of the Atomic Magnetic Moment Orientation in the Antiferromagnetic Compound CrSb. A. I. Snow. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 365.

Studies show that the above compound has the Ni-arsenide structure and shows a marked decrease in magnetic susceptibility as the temperature is lowered from the antiferromagnetic Curie point (450°C.)

4135 The Saturation Magnetic Moment of Alloys on the Collective Electron Theory. J. E. Goldman. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 375.

Discusses the perturbing effect of an alloying element on the energy bands in a metal.

4136 The Electronic Specific Heat in Chromium and Magnesium. S. A. Friedberg, I. Estermann, and J. E. Goldman. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 375-376.

Presents results of an experimental investigation on the above. Data are graphed and tabulated.

4137 The Magnetic Susceptibility of Chromium. T. R. McGuire and C. J. Kriessman. *Physical Review*, v. 85, ser. 2, Feb. 1, 1952, p. 452-454.

The above was measured from −195 to 1440°C. and was found to increase from 3.42×10^{-6} to approximately 4.30×10^{-6} emu. per g. at the highest temperature. A transition is recorded in the region of 1400°C. marked by sharp increase in susceptibility and temperature hysteresis. 20 ref.

4138 Calculation of the g Factor of Metallic Sodium. Y. Yafet. *Physical Review*, ser. 2, v. 85, Feb. 1, 1952, p. 478.

The effect of spin-orbit coupling on the electronic value expected in a spin-resonance experiment on metallic Na in a field H was calculated.

4139 The Nuclear Magnetic Resonance of Titanium and Arsenic. C. D. Jeffries, H. Loeliger, and H. H. Staub. *Physical Review*, ser. 2, v. 85, Feb. 1, 1952, p. 478-479.

Describes and calculates the above.

4140 The Domain Structure of a Silicon-Iron Crystal. L. F. Bates and C. D. Mee. *Proceedings of the Physical Society*, v. 65, sec. A, Feb. 1, 1952, p. 129-140.

Powder patterns were obtained for the (100) and (011) surfaces of a carefully shaped single crystal of 3% Si iron. Considerable numerical discrepancies, which are attributed to the complicated nature of the closure domains on the (011) surface, were found. 12 ref.

4141 A Study of Surface Closure Domains by the Powder Pattern Technique. L. F. Bates and C. D. Mee. *Proceedings of the Physical Society*, v. 65, sec. A, Feb. 1, 1952, p. 140-144.

The powder patterns in the neighborhood of cavities and inclusions on the surfaces of single crystals of 3% Si iron were studied and the photographs are evidence for the essential correctness of current views on closure domain structures.

4142 The Approach to Saturation Magnetostriction of Nickel. E. W. Lee. *Proceedings of the Physical Society*, v. 65, sec. B, Feb. 1, 1952, p. 162-163.

Measurements were made of the differential magnetostriction as a function of a steady applied field. Data are graphed.

4143 The Viscosities of Liquid Lithium, Rubidium and Caesium. E. N. Da C. Andrade, and E. R. Dobbs. *Proceedings of the Royal Society*, ser. A, v. 211, Feb. 7, 1952, p. 12-30.

The oscillating-sphere method was applied to determination of the above, from their melting-point upwards over a range of temperatures. The peculiarities of the 3 metals made necessary development of special methods of handling. 16 ref.

4144 The Thermal and Electrical Conductivity of Copper at Low Temperatures. R. Berman and D. K. C. MacDonald. *Proceedings of the Royal Society*, ser. A, v. 211, Feb. 7, 1952, p. 122-128.

The above was measured continuously between 90 and 2°K.

12. *Metals—Physical Properties and Tests*

The specimen, which was of spectrographic purity, was found to have a pronounced minimum in its electrical resistance at about 10°K. Marked disagreement with theory was found in the temperature variation both of thermal conductivity and of Lorenz number. 11 ref.

4145* Chemical Thermochemistry and Thermodynamics. (In Spanish.) Jose Manuel Pertierra. *Técnica Metalúrgica*, v. 7, Aug. 1951, p. 281-295.

Discusses volatilization of metals during melting, Dalton's law of partial pressures, thermodynamics of chemical reactions, variation of enthalpy and free energy with temperature, specific heat of iron, heat of the α-Fe/γ-Fe and reverse transformations; specific heat of iron oxides; free energy of formation of FeO and Fe_2O_3; solution of FeO in molten Fe; and composition of the oxide film on Fe. Data are tabulated and charted.

4146* Theory of the Electrical Conductivity of Metals. I. (In German.) H. Koppe. *Zeitschrift fur Naturforschung*, v. 7a, Jan. 1952, p. 17-22.

A method of treating "transport" phenomena in metals especially suitable for Fermi-effect calculations is presented.

4147* The Anomaly of the Electromagnetic and Thermomagnetic Transverse Effect. (In German.) H. Fieber, A. Nedoluha, and K. M. Koch. *Zeitschrift für Physik*, v. 131, no. 2, 1952, p. 143-155.

On the basis of H. Frölich's equation, coefficients of the 4 transverse effects are derived; and it is shown that the Ettinghausen and Nernst effects may be considered as secondary thermoelectric effects arising from the longitudinal limitation of the test strips. Relationships of the Hall and the Righi-Leduc effects to above are considered. A table shows qualitative characteristics of Ag, Al, Cd, Co, Cu, Fe, Ni, Zn, Au, and Sb.

4148 Interphase Tension of Iron Alloys at Boundary With Slag. S. I. Popel, O. A. Esin, and P. V. Gel'd. Henry Brutcher, Translation 2734, 8 pages. (From *Doklady Akademii Nauk SSSR*, v. 75, Nov. 11, 1950, p. 227-230.)

Previously abstracted from original.

See also:

4008 (electrical properties of oxide film on Al)
4021 (physical properties of sputtered Ag films)
4027 (anodized Al alloys)
4037 (work functions of thin Ag films)
4038 (work functions of vacuum-deposited Au films)
4091 (thermodynamics of aging of alloys)
4170 (resistivity vs. stress-strain properties of wires)
4173 (conductivity and density of Mg-Th alloys)
4185 (electrical effects of Hg on Se)
4188 (physical properties of Mg alloys)
4198 (electrical properties of Cu wire)
4311 (magnetic properties of stainless steels)
4400 (physical properties of Ge)
4402 (properties of nuclear reactor materials)
4408 (physical properties of special alloys)
4410 (permanent-magnet alloys)
4562 (bonding of MoS_2 lubricants to metals)
4887 (electrical conductivity of molten iron oxide)
4962 (properties of Cu-Ni capacitor)
4971 (Ni and Ni alloys—composition effects on oxide-coating emission)

13. METALS—MECHANICAL PROPERTIES AND TESTS

4149* Thermodynamic Criteria of Resistance to Plastic Deformation of Saturated Solid Solutions of Metals. (In Russian.) K. A. Osipov and B. P. Stoiukhin. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 1, 1951, p. 627-630.

The above are developed in conformance with Le Chatelier's law and well-known experimental data. Results are charted.

4150* Statistical Correlation of Highly Scattered Data. (In Italian.) F. Gatto. *Alluminio*, v. 20, Dec. 1951, p. 533-539.

After explaining the practical limitations of ordinary methods, some improvements are suggested. The methods were applied to determination of the hardness/breaking stress ratio for Al alloys containing Zn, Mg, and Cu. Data are charted. 12 ref.

4151* Plans for Switches, Frogs, Crossings, Spring, and Slip Switches. M. J. Zeeman, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 772-774.

Presents the above to provide improved track support at the approaches to open-deck bridges and trestles. Lists minimum requirements for tensile properties of bolts and nuts.

4151a* Service Tests of Designs of Manganese Castings in Crossings at McCook, Ill. M. J. Zeeman, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 774-775.

Discusses the above. Tests indicate that from the standpoint of extent of cracks, the shot-peened casting has performed better than the Morden-Ramapo design. No conclusions are justified as to the benefits from shot peening.

4152* Service Tests of Solid and Manganese Insert Crossings Supported by Steel T-Beams and Longitudinal Timbers. M. J. Zeeman, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 776-778.

Presents results of service tests on installations of 1946, and May 1949.

4153* Investigation of Failures in Railroad Rails. R. E. Cramer. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 843-849.

Presents results of the above on 52 rails submitted by 15 railroads. A summary and discussion of failures is given along with tabulated data for each rail. Photographs.

4154* Rail Failure Statistics, Covering (a) All Failures; (b) Transverse Fissures; (c) Performance of Control Cooled Rail. Ray McBrian, chairman. *American Railway Engineering Association, Bulletin*, v. 53, Feb. 1952, p. 849-866.

Includes failures reported by 64 railroads on all of their mainline railway mileage.

4155* Service Tests on Various Types of Joint Bars. T. A. Blair, chairman. *American Railway Engineering Association, Bulletin*, v. 53 Feb. 1952, p. 868-876.

Presents field work, analysis of data, and report of the measurements on the above.

4156* Joint Bar Wear and Failures: Revision of Design and Specifications for New Bars, Including Insulated Joints and Bars for Maintenance Repairs. E. E. Chapman, chairman. *American Railway Engineering Association, Bulletin*, v. 53, Feb. 1952, p. 876-894. Includes appendices: "Tenth Progress Report of the Rolling-Load Tests of Joint Bars," R. S. Jensen; and "Service Tests on the Burlington Railroad Near Fort Morgan, Colo., of Joint Bars of Different Metallurgies."

Presents detailed information and results of service tests on the above. Includes rolling-load tests, ways of increasing fatigue life, micrographs revealing decarburization, effects of heat-treatment and of chemical composition.

4157* Rail Failures Resulting From Engine Wheel Burns, Including Effect of Repairing Such Burns by Oxyacetylene or Electric Welding. J. B. Akers, chairman. *American Railway Engineering Association, Bulletin*, v. 53 Feb. 1952, p. 894-898.

4158* Causes of Shelly Spots and Head Checks in Rail: Methods for Their Prevention. L. S. Crain, chairman. *American Railway Engineering Association, Bulletin*, v. 53, Feb. 1952, p. 899-920.

Compares performance of heat-treated and control-cooled rails with respect to the above, and service tests of heat-treated rail on the C. & O., Penna., N. & W., and Great Northern Railways. Includes appendices, "Tenth Progress Report of the Shelly Rail Studies at the University of Illinois," and "Summary of Progress on Investigation of Steel Relaxation in Rail Steel," separately abstracted.

4159* Tenth Progress Report of the Shelly Rail Studies at the University of Illinois. R. E. Cramer. *American Railway Engineering Association, Bulletin*, v. 53, Feb. 1952, p. 902-915.

Presents and discusses results of mechanical and cradle rolling-load tests on rail specimens of C, Mn, Si, Cr, Ni, and V alloy steels. Photomicrographs.

4160* Recent Developments Affecting Rail Section. W. J. Cruse, chairman. *American Railway Engineering Association, Bulletin*, v. 53, Feb. 1952, p. 920-940.

Presents information on measurement of stresses in 115-RE and 132-RE rail in curve track, stresses developed around the bolt hole of a rail with the joint in tension, redesign of 100-RE rail and joint bars, and rail-web bolt-hole finish effects on fatigue failure.

4161* Titantium and Its Alloys. H. W. Worner. *Australasian Engineer*, Jan. 7, 1952, p. 46-51.

Published information is reviewed in the light of some general physical laws pertaining to alloys. Mechanical properties are discussed chiefly from the standpoint of the relationships between properties, structure, and heat-treatment. Data concerning a few types of promising heat-treatable alloys are presented; and observations regarding the present uses and possible future applications of Ti-rich alloys are included. 23 ref.

4162* Investigation of the Mechanical Properties of Welded Joints in Circular Specimens. (In Russian.) A. S. Fal'kevich and I. E. Neifel'd. *Avtogennoe Delo*, v. 22, May 1951, p. 18-20.

Tests were made on circular specimens cut from welded carbon-steel tubes and similar articles. The test method is described and results are compared with data from standard specimens. Data are tabulated and charted.

4163* The Cause of "Training" in Fatigue Stress. (In German.) F. Vitovec. *Berg- und Hüttenmännische Monatshefte, der Montanistischen Hochschule in Leoben*, v. 97, Jan. 1952, p. 3-5.

Observed phenomenon of increasing fatigue strength by removing a thin layer of material from the surface of stressed material is explained on the basis of reduction of the notch effect because of reduction in the number of submicroscopic cracks in the surface. Includes graphs and diagrams.

4164* Grain Refining of Steels by Hot Working. (In German.) Richard Werner. *Berg- und Hüttenmannische Montashefte der Montanistischen Hochschule in Leoben*, v. 97, Jan. 1952, p. 15-17.

Reports on a series of experiments on the various factors that determine the grain structure of hot-worked steels. An empirical formula for estimation of grain-size reduction is presented and discussed.

4165* Phenomenological Theories of Creep. A. Graham. *Engineer*, v. 193, Feb. 8, 1952, p. 198-201; Feb. 15, 1952, p. 234-236.

A formula with 4 adjustable constants relating permanent strain to stress, time, and temperature, is shown to represent successfully the decelerating stage of uniaxial creep in several dissimilar metals. Applications to tertiary creep, the tensile test, and stress relaxation are considered. Data are compared for Nimonic 80, G-18-B, Stellite 8, Hiduminium RR-59, OFHC Cu, and high-purity Pb. 48 ref.

4166* Ship Research. S. Livingston Smith. *Engineering*, v. 173, Jan. 25, 1952, p. 105-106; Feb. 1, 1952, p. 156-160; Feb. 8, 1952, p. 185-187.

Describes results of an investigation of stresses and deflections in mild-steel ship plates. Stresses due to welding were studied. Vibration characteristics are discussed. Concluding article deals with design of propellers and boilers.

4167 New Heat-Resistant Alloy Is Developed. *Inco Magazine*, v. 25, Winter 1951-52, p. 13-14.

Discusses Incoloy—an alloy developed for resistance to high temperature and corrosion. Tabulated tensile properties are given.

4168 Lower Alloys Developed for High Temperature Use. C. L. Clark. *Iron Age*, v. 169, Feb. 21, 1952, p. 98-102.

Discusses low-alloy steels modified for use at 1100°F. Describes development programs, and presents results obtained giving mechanical properties of the various types. Tabular data.

4169 On the Empirical Law of Adhesive Wear. J. T. Burwell and C. D. Strang. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 18-28.

Measurements were made of the wear of rubbing steel surfaces as a function of load, distance of travel, and hardness under controlled conditions which eliminated the effects of all factors except adhesion. Results are discussed in the light of the current adhesion theory of dry friction.

4170 Investigation of Stress-Strain Relations of Metal Wires by Electrical Resistance Changes. Irwin Vigness. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 43-47.

Describes a method by which the stress-strain curve of a wire tensile specimen can be derived from measurements of its changes of electrical resistance as a function of strain. Examples are shown illustrating the linear resistance-strain relations and applications of the method for several suitable materials. The resistance-strain characteristics of several materials that are not suitable are given, together with a statement of some mechanisms responsible.

4171 Preferred Orientation of Arc-Cast Molybdenum Sheet. M. Semchyshen and G. A. Timmons. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 279-286.

Mechanical properties were measured at varying angles to the rolling direction to determine the effect of preferred orientation on anisotropy in Mo sheet which has been straight, cross, or compression rolled. Includes photomicrographs, graphs, and tabular data. 15 ref.

4172 Extent of Strain of Primary Glide Planes in Extended Single Crystalline Alpha Brass. R. Maddin. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 270.

Shows that strain distribution in the above originates in the incongruent nature of the slip process. Use of a 2-stage rotation process seems valid in attempting to explain the relation between the orientation of recrystallized grains and the matrix from which they have grown.

4173 Properties of Magnesium-Thorium and Magnesium-Thorium-Cerium Alloys. T. E. Leontis. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 287-294.

Presents results of a systematic study of the effects of compositional variation on tensile properties, creep resistance, conductivity, density, and metallography of Mg-Th alloys containing up to 50% Th both in the sand-cast and in the extruded states. The effect of addition of Ce to Mg-Th alloys is also reported. Photomicrographs and tabular data.

4174 Plastic Deformation of Magnesium Single Crystals. E. C. Burke and W. R. Hibbard, Jr. *Journal of Metals*, v. 4, Mar. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 295-303.

The above was studied by tensile tests at room temperature, utilizing an improved preparation and testing technique. Consistent critical resolved shear-stress values for basal slip were obtained. The advent of pyramidal slip at room temperature was rationalized upon the basis of grip constraints. A bend-twinning hypothesis is advanced as an explanation of mechanical twinning which occurs as a complex stress-relief mechanism. 26 ref.

4175 New Magnesium-Zirconium Casting Alloy. J. M. Payne, A. D. Michael, and R. W. Eade. *Metal Industry*, v. 80, Feb. 8, 1952, p. 103-104.

Describes a new Mg-Zn-rare earth-Zr casting alloy developed to meet special mechanical strength requirements. This alloy has found application on a large scale for stressed castings.

4176* Creep. (In French.) Maurice de Courcel. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 847-849, 851-852.

Presents brief outline of the phenomenon of creep in monocrystalline and polycrystalline metals, giving results of tests on pieces susceptible to creep. Includes micrographs, diagrams, and photographs.

4177* Physics of Metals: Morphological Analysis of Fractures. (In French.) H. de Leiris. *Metaux: Corrosion—Industries*, v. 26, Dec. 1951, p. 471-496.

Presents details of a comprehensive study of the macrostructure of various types of cracks and failures of different metals. The

13. *Metals—Mechanical Properties and Tests*

subject is treated systematically under the following main headings: morphological analysis of failures by progressive crack development; and morphological analysis of semi-brittle tears. Includes discussion of failures of large tanks and of ships. Numerous macrographs. 24 ref.

4178* Bend and Vibratory Stress in Winding Ropes. Richard Saxton. *Mining Journal*, v. 238, Feb. 15, 1952, p. 170-171.

Discusses construction, groove wear, and vibratory stress of the above. States that cast-iron sheaves or drums are satisfactory where the pressure does not exceed 450 psi., and those made of cast steel for pressures between 800-900 lb., while Mn steel easily withstands pressures up to 2,000 psi. Mn steel is recommended particularly for sheaves.

4179 Effect of a Copper Surface Film on Twinning in Zinc Mono-Crystals. John J. Gilman. *Nature*, v. 169, Jan. 26, 1952, p. 149-150.

Results of an investigation show that an electrodeposited film of Cu markedly increased the critical stress required to cause twinning of monocrystals. The effect does not seem to be caused simply by the mechanical strength of the copper. Data are tabulated.

4180 Thermal Dependence of Elastic Constants of Electrodeposited Chromium. H. Pursey. *Nature*, v. 169, Jan. 26, 1952, p. 150.

Measurements of Young's modulus and modulus of rigidity were made at frequencies between 15 and 160 kc./s. over the range 10-80°C. on a tube of electroformed Cr which had been annealed for 15 hr. at 544°C. by a resonance method using magnetostrictive exciters and receivers. Data are graphed.

4181 Plastic Deformation and the Meyer Constants of Metals. M. A. Meyer and K. J. Blok Van Laer. *Nature*, v. 169, Feb. 9, 1952, p. 237-238.

An analysis of the above and results of experiments on well-annealed samples of Sn, Zn, and Cd.

4182 Grain Movements During Creep. R. C. Gifkins. *Nature*, v. 169, Feb. 9, 1952, p. 238-239.

Presents results of an investigation of the creep properties of a range of solid-solution alloys of Tl in Pb; and of their mode of deformation.

4183* Internal Friction in Iron and Steel. J. D. Fast and L. J. Dijkstra. *Philips Technical Review*, v. 13, Dec. 1951, p. 172-179.

Damping experiments, at different temperatures, with a torsion-wire pendulum made of iron or steel containing a little C or N in solution (with or without the admixture of Mn) throw some light upon the extent to which the dissolved atoms precipitate after quenching of the metal. Shows how the internal friction resulting from the solute atoms jumping from one interstice in the crystal lattice to another causes the amplitude of the torsional oscillations to decay exponentially. Results of the damping experiments make it possible to give a new explanation of the mysterious phenomenon of "magnetic aging."

4184 The Production of Large Tensile Stresses by Dislocations. J. S. Koehler. *Physical Review*, ser. 2, v. 85, Feb. 1, 1952, p. 480-481.

Shows that an edge type dislocation has large tensile stresses associated with it. Maximum tensile stress is calculated.

4185 The Effect of Mercury on Selenium. H. K. Henisch and E. Q. Saker. *Proceedings of the Physical Society*, v. 65, sec. B, Feb. 1, 1952, p. 149-154.

The extent to which mercury can penetrate into Se specimens was investigated. Results show that there is penetration to considerable depths which may be due to diffusion through the lattice or along grain boundaries. The principal electrical effects are shown to be due to the formation of mercuric selenide at the surface. There is also evidence, from experiments with radioactive mercury, of rapid surface diffusion.

4186 Selecting Hard Facing Materials to Resist Impact, Heat, Friction, Abrasion. Howard S. Avery. *Product Engineering*, v. 23, Mar. 1952, p. 154-159.

Discusses the above and includes a number of graphs and tables. Classifies hard-facing alloys by composition; presents a graded series of wear-resistant alloys; gives data on mechanical properties. Covers irons, steels, various alloys, and W carbide composites.

4187 Torsional Fatigue Failures. J. O. Almen. *Product Engineering*, v. 23, Mar. 1952, p. 168-170.

Analytical studies of fatigue fractures in alloy-steel torsion-bar springs for military vehicles, in spite of inherent planes of weakness, show that torsional-fatigue failures are caused by, and develop normal to, the tensile component of the applied stress. Data are presented bearing on the characteristics of torsional failures obtained from fatigue tests of torsion bars which were subject to experimental variations in processing.

4188* Magnesium Alloys. F. A. Fox. *Research*, v. 5, Feb. 1952, p. 77-81.

Surveys present status of development, in comparison with those available in 1940. Mechanical and physical properties, as well as microstructure, are discussed.

4189* Microhardness and Its Metallurgical Applications. (In French.) H. Bückle. *Revue de Métallurgie*, Dec. 1951, p. 957-965; disc., p. 965.

Presents brief outline of different kinds of microhardness testers and describes the special laws of microhardness. Includes diagrams, photographs, charts, and micrographs. 47 ref.

4190* X-Ray Microstructure Investigations of the Creep of Steel. (In German.) W. Epprecht. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 18, Jan. 1952, p. 10-21.

X-ray studies were made to investigate changes of austenite crystals in the range 570-750°C. Results show that creep, manifested by slip of austenite crystals, has a strain-hardening effect. The experiments were made with variation of temperature, load, and time. Includes tables and X-ray diagrams. 26 ref.

4191* Mechanical Aging (Strain Aging) of Hard-Drawn Patented Steel Wire. (In German.) Fritz Schweir. *Stahl und Eisen*, v. 72, Jan. 17, 1952, p. 58-66.

Presents results of aging experiments on above of different carbon content and diameter. Variations of mechanical properties are extensively tabulated and charted. 13 ref.

4192 Steel Brittleness Studied. *Steel*, v. 130, Mar. 10, 1952, p. 146, 148.

Outlines results of NBS tests on carbon steels containing 0.9 or 1.6% Mn, 0.2-0.3% Si, and variable N_2. Results showed that N_2 is beneficial to low-temperature notch toughness if present as aluminium nitride but detrimental if in other nitride forms.

4193* Titanium Takes a Test. J. Segard. *Welding Engineer*, v. 37, Mar. 1952, p. 24-27.

Presents and discusses results of tests conducted by Ryan Aeronautical to determine the suitability of Ti to production of aircraft components. Tests included cold and hot forming, welding, heat treating, deformation, and machining.

4194* Hard Facing for Impact. Howard S. Avery. *Welding Journal*, v. 31, Feb. 1952, p. 116-143; disc., p. 143-145.

Static and dynamic compression testing are described, together with data for important hard-facing alloys, while the importance of engineering to avoid tension is stressed. Critical limitations of impact energy and velocity are suggested to minimize structural damage and to help in alloy selection. Hard-facing alloy types are described in some detail: Steels, carbides, alloy irons, and nonferrous-base alloys. A few representative applications are given and advantage of composite structures in wear control are shown.

4195* Stress Studies of Bulkhead Intersections for Welded Tankers. Wm. R. Campbell, L. K. Irwin, and R. C. Duncan. *Welding Journal*, v. 31, Feb. 1952, p. 68s-75s; disc., p. 75s-77s.

Presents a study on the above. The elastic stress distribution at room temperature, strain distribution prior to failure at 0°F., and energy for failure of 0°F., are presented. Stress values in

the region of the intersection are compared with stresses in the longitudinal bulkhead bordering the intersection. Stress concentrations and energy at failure for the different specimens are also compared.

4196* Fracturing and Fracture Dynamics. G. R. Irwin and J. A. Kies. *Welding Journal*, v. 31, Feb. 1952, p. 95s-100s.

Presents a descriptive review of the above. A direct application of energy-balance principles for calculating conditions for development of rapid fracturing is discussed and emphasized. Photomicrographs illustrate fractures in ferrous and nonferrous metals.

4197* Effect of Surface Condition on Fatigue Bending Strength. (In German.) Paul Gimmel. *Werkstoffe und Korrosion*, v. 2, Dec. 1951, p. 461-462.

Discrepancies in published fatigue test results are shown to be largely due to different surface conditions. Fatigue-test results were found to be influenced by methods and time of polishing the test specimens. Gives results for 2 steels and Armco iron. Photomicrographs, graphs and tables.

4198* Present Status of the Quality Requirements for Copper Wire in the Electrical Industries. (In German.) Rudolph Reinbach. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 5, Jan. 1952, p. 9-14.

Discusses the basic causes of substandard Cu wires with respect to conductivity, workability, and surface quality. Graphs, photographs, and tables.

Miscellaneous Publications

4199 A Study of Poisson's Ratio in the Yield Region. George Gerard and Sorrel Wildhorn. National Advisory Committee for Aeronautics, Technical Note 2561, Jan. 1952, 30 pages. (TL570 Un3t)

The above is presented for the Al alloys 14S-T6, 24S-T4, and 75S-T6. The test data are for simple tensile or compressive loading along 3 orthogonal axes. Data are graphed.

4200 Creep in Metals. A. D. Schwope, F. R. Shober, and L. R. Jackson. National Advisory Committee for Aeronautics, Technical Note 2618, Feb. 1952, 52 pages. (TL570 Un3t)

Results of a study of creep in single crystals of high-purity aluminum are presented and discussed. It is shown that, at low stresses, the creep phenomenon appears to be consistent with Mott and Nabarro's theory of exhaustion creep, while at higher stresses, results appear to be more in accord with ideas expressed by Andrade. Graphs and tables. 25 ref.

4201 Fatigue Strengths of Aircraft Materials. Axial-Load Fatigue Tests on Notched Sheet Specimens of 24S-T3 and 75S-T6 Aluminum Alloys and of SAE 4130 Steel With Stress-Concentration Factor of 1.5. H. J. Grover, W. S. Hyler, and L. R. Jackson. National Advisory Committee for Aeronautics, Technical Note 2639, Feb. 1952, 22 pages. (TL570 Un3t)

See also:
3834 (effects of gases in steels)
3880 (mechanical properties of ferrous and nonferrous alloys)
3888 (mechanical properties of low-pressure die-cast Al)
3938 (deep-drawing steel sheet)
3947 (effects of hot forming on mechanical properties of Al alloys)
3951 (cold working for improved mechanical properties)
3955 (heat-resisting sintered Al)
3959 (mechanical properties of sintered iron compacts)
3969 (failures of steel welds)
3975 (mechanical properties of Al and Mg spotwelds)
3979 (tensile strength of flash-welded steel tubes)
3980 (strength of welded structures)
3987 (stress relaxation in rail steel)
4013 (properties of Zn coatings)
4022 (microstress in Ni films)
4027 (hardness of anodized Al alloys)
4031 (phosphated and galvanized coatings)
4073 (effect of C on intergranular brittleness of Mo)
4076 (titanium alloys)
4078 (cast steels)
4090 (creep properties of metals—relationships of)
4113 (thermal shock tests on gas-turbine materials)
4121 (elastic properties of Invar and Elinvar alloys)
4131 (properties of Cu and Ni-Ag alloys)
4359 (endurance-limits determination)
4402 (properties of nuclear reactor materials)
4405 (mechanical properties of carbon and alloy-steel springs)
4406 (mechanical properties of spring materials)
4409 (Triplex steel-wear resistance in plows)
4412 (low-alloy structural steels)
4413 (structural alloy steels)
4416 (mechanical properties of steels for glass molds)
5025 (mechanical properties of boron steels)

14. CORROSION

4202* Oxidation of Metallic Uranium. (In French.) Jean Loriers. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 91-93.

Briefly investigates above and compares the oxidation mechanism of U with that of Ce above 140°C. Includes diagrams.

4203* "Immunization" of Metallic Surfaces Against the Action of Corrosive Agents. (In French.) Jean Loiseleur. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 7, 1952, p. 260-262.

Discusses the formation of a monomolecular layer of Cassius purple on a polished Ag or Cu plate. This imparts to the plate a remarkable resistance to oxidation and reaction with sulfur. Application to other metals and mechanism of the protective action are discussed. "Immunization" is defended as a suitable term for the particular type of protection.

4204* Corrosion of Metals by Hydrocarbon Solutions of Aliphatic Acids. (In Russian.) L. G. Gindin and V. A. Kazakova. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 21, 1951, p. 389-392.

The corrosion of Mg, Fe and Pb by solutions of acetic, butyric, valeric, caproic, and lauric acids in benzene, iso-octane, and petroleum ether was investigated. Data are discussed, tabulated, and charted. 11 ref.

4205* The Influence of the Solvent in Acid Solutions on Their Behavior Toward Metals. (In Russian.) L. G. Grindin, V. A. Kazakova, and I. N. Putilova. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 11, 1951, p. 777-780.

A study was made of the corrosion of Fe and Cu by solutions of butyric acid in water, benzene, iso-octane, and vaseline oil. Data are discussed and tabulated. 21 ref.

4206 The Reaction Between Uranium and Oxygen. Daniel Cubicciotti. *Journal of the American Chemical Society*, v. 74, Feb. 20, 1952, p. 1079-1081.

Uranium was found to oxidize according to a parabolic law at low temperatures and according to a linear law at higher temperatures.

4207* Prevention of Damage Due to Brine Drippings on Track and Structures. W. E. Cornell, chairman. *American Railway Engineering Association Bulletin*, v. 53, Feb. 1952, p. 779.

Presents results of an investigation of nontoxic additives for prevention of corrosion due to brine drippings.

4208* Semi-Accelerated Corrosion Tests on Medium and High Tensile Steel in Contact With Phenolic Foam. H. J. Start, J. Kaminetsky, and R. R. Winans. *Journal of American Society of Naval Engineers*, v. 64, Feb. 1952, p. 49-57.

Action of 3 types of phenolic foam and of balsa wood with respect to corrosion of above steels and relationships between the pH measurements on water extracts of crushed samples and the observed corrosion effects were determined. Micrographs. Data are tabulated.

4209* The Distinguishing Characteristics of Boiler Tube Failures. Frank E. Clarke. *Journal of American Society of Naval Engineers*, v. 64, Feb. 1952, p. 83-94.

Discusses the above. "Cavities" and "scars" are defined as pits, grooves, gouges, and wasted areas which have resulted in obvious internal or external loss of tube metal, without evidence of abnormal temperatures. They include generalized corrosion, steam gouging, and mechanical scars. "Cracks and fissures" category includes all failures which occur as narrow slits or

14. *Corrosion*

crevices without significant deformation of tube shape or loss of metal. The various types are illustrated.

4210* The Chemistry of Marine Corrosion. Carvel Hall Blair. *Journal of American Society of Naval Engineers*, v. 64, Feb. 1952, p. 121-126.

Explains the theory of corrosion of metals and shows how a knowledge of this theory can be put to practical use.

4211 Corrosion Problems in Processing. U. R. Evans. *Canadian Chemical Processing*, v. 36, Feb. 1952, p. 38, 40-41.

Discusses the main types of corrosion encountered in chemical industry, in connection with cooling systems.

4212* Hydrogen Sulphide Corrosion Cracking of Steel. L. W. Vollmer. *Canadian Mining and Metallurgical Bulletin*, v. 45, Feb. 1952, p. 103-109; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 55, 1952, p. 89-95.

Presents results of an investigation on the above. The failures of 9%-Ni-steel tubing were initiated by stress-corrosion cracking. Data are tabulated. Micrographs.

4213 Electrochemical Studies of Anaerobic Corrosion in Presence of Sulphate-Reducing Bacteria. F. Wormwell and T. W. Farrer. *Chemistry & Industry*, Feb. 2, 1952, p. 108-109.

Presents results of the above investigation. Electrode potential measurements on mild steel specimens were made in media inoculated with *Desulfovibrio desulfuricans* and a sterile control.

4214 Cathodic Protection of Moving Underwater Equipment. William S. Merrithew. *Corrosion* (Technical Section), v. 8, Mar. 1952, p. 90-92.

Describes successful operation of a cathodic protection system to safeguard above equipment at the Water Softening and Filtration Plant of the Metropolitan Water District, Southern California. Anodes are used.

4215 Chemical Treatment to Mitigate Corrosion. J. G. Jewell. *Corrosion* (Technical Section), v. 8, Mar. 1952, p. 100-108.

A review of surface-active and ionic-type corrosion inhibitors, methods of neutralization and buffering, removal of corrosive agents, self-repairing coatings, and bactericides. Anodic and cathodic agents are considered at length and the various factors incident to the use of these types of inhibitors described. Organic inhibitors, adsorption inhibitors, pickling inhibitors, oil-wetting agents, and special applications of anti-corrosion additives are considered. 39 ref.

4216 Some Effects of Cathodic Protection on Conventional Paints. L. P. Sudrabin, F. J. LeFebvre, D. L. Hawke, and A. J. Eickhoff. *Corrosion* (Technical Section), v. 8, Mar. 1952, p. 109-114.

Four groups of tests on above were set up in fresh and in salt water to determine suitability of various combinations of paint coatings and cathodic protection for steel structures immersed in water or buried in soil. Results are tabulated, illustrated, and discussed.

4217* Low-Energy Measurement Problems in Cathodic Protection. H. N. Hayward and R. M. Wainwright *Electrical Engineering*, v. 71, Mar. 1952, p. 276-278. (To be published in *AIEE Transactions*, v. 71, 1952.)

Some elementary methods of obtaining metal-to-soil potential measurements are analyzed for the purpose of developing rugged yet sufficiently accurate field measuring equipment. These potentials often must be known for cathodic-protection work.

4218* Causes and Prevention of Corrosion. Arthur Marsden. *Gas Journal*, v. 269, Feb. 13, 1952, p. 413-414, 419-420, 425; disc., p. 425-426, 429.

Contact of dissimilar metals; non-uniformity of the metal, whether due to impurities or to segregation; presence of oxygen in the surrounding medium; internal stresses in metals; stray electric currents, which often assist in the destruction of gas and water mains; and elevated temperatures are discussed as factors in the above. Various forms of protection are cited.

4219 How You Can Avoid Boiler Tube Corrosion. H. F. Hinst. *Heating, Piping & Air Conditioning*, v. 24, Mar. 1952, p. 77-83.

An analysis and discussion of the types and causes of corrosion of steel boiler tubes. Includes 7 general rules for avoiding serious tube corrosion problems.

4220 British Study Corrosion of Steel, Iron Pipe. *Iron Age*, v. 169, Feb. 21, 1952, p. 97.

Discusses the above, stressing cathodic protection. Tabular data give results of tests on steel and cast-iron pipe in various soils.

4221 Scale in Turbine Blading; Its Cause, Its Influence on Performance and Its Prevention. R. T. Rolfe. *Iron & Steel* v. 25, Feb. 1952, p. 53-55. (Reprinted from *Allen Engineering Review.*)

The above deposits were found to be composed substantially of boiler salts carried over in the steam. Data are tabulated. Illustrations.

4222 Corrosion by Retained Treatment Chemicals on Phosphated Steel Surfaces. S. G. Clarke and E. E. Longhurst. *Journal of the Iron and Steel Institute*, v. 170, Jan. 1952, p. 15-18.

Results of humid-atmosphere corrosion tests are presented. A simple performance test is suggested as a guide if the corrosive tendency of a phosphating solution is not known, or if the geometry of the parts treated makes effective washing difficult.

4223 Corrosion of Welded 18/8 Type Chromium-Nickel Steels in Concentrated Nitric Acid. H. T. Shirley. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 111-118.

Presents a study of the attack by concentrated HNO_3 on Ti-stabilized Cr-Ni steels. It is considered that the mechanism is essentially an extension of intercrystalline corrosion from boundary Cr impoverishment. Data are tabulated. Photomicrographs.

4224 Discussion on the Paper—"Protection of Structural Steelwork Against Atmospheric Corrosion," J. C. Hudson. *Journal of the Iron and Steel Institute*, v. 170, Feb. 1952, p. 153-156.

Covers the above previously published in this journal.

4225* Hydrogen Evolution From the Tin-Iron Couple in Alkaline Solution. S. C. Britton. *Journal of Applied Chemistry*, v. 1, Suppl. Issue 2, 1951, p. S132-S136.

Corrosion of Sn in strongly alkaline solutions may be accelerated by contact with iron and may proceed even in the absence of O_2, H_2 being evolved from the iron. The degree of acceleration depends on the area of exposed iron. During the cleaning of tinned ware in alkaline solution, contact of the work with a bare steel tank should be avoided to reduce corrosion of the Sn.

4226 The Corrosion Resistance of Some "Minor" Metals; A Review of the Available Information. *Metal Industry*, v. 80, Feb. 1, 1952, p. 83-85; Feb. 8, 1952, p. 111-113.

Surveys the above. The first part covers Ti and Ti-Cr alloys. The second deals with Cb, Zr, Mo, Ta, and Ta-Mo alloys. 12 ref.

4227 The Salt-Spray Test. *Metal Industry*, v. 80, Feb. 15, 1952, p. 123-126.

Covers history, methods, types of apparatus, and uses.

4228* Thermobalance Study of Oxidation of Metals. Copper-Tin Alloys. (In Italian.) F. De Carli and N. Collari. *Metallurgia Italiana*, v. 44, Jan. 1952, p. 1-5.

Presents results of above study, involving continuous photographic recording of weight changes. In the case of Cu-Sn alloys, a depression in the oxidation is evident for the α-phase, which becomes more and more pronounced as it approaches saturation of the primary solid solution. The γ-phase, on the other hand, is more readily oxidizable, whereas the ϵ-phase is practically non-oxidizable. Believes that further developments of this method may prove to be of interest in the study of industrial heat-resisting alloys. 30 ref.

4229* Research on Salt-Spray Corrosion Tests; Characteristics of the Fog. (In Italian.) G. Bianchi and A. Mora. *Metallurgia Italiana*, v. 44, Jan. 1952, p. 9-13.

Experiments on the operation of the salt-spray chamber for corrosion tests were carried out by means of sedimentation tests, using a new solarized photographic-plate method. Dimensions

of the fog particles were also determined. Apparatus is diagrammed; results are charted.

4230* Protection Against Corrosion and Use of Low-Alloy Steels. (In French.) D. Bermane. *L'Ossature Métallique*, v. 17, Jan. 1952, p. 42-48.

Presents results atmospheric tests on uncoated and paint-coated steels of various compositions. Includes tables, diagrams, charts, and photographs. 15 ref.

4231 How Six Plants Cut Corrosion Rates by 95%. William C. Uhl. *Petroleum Processing*, v. 7, Feb. 1952, p. 190-197.

Presents a survey on the above. The relatively high-molecular-weight, semi-polar inhibitors employed are believed to function by their adsorption on metal surfaces to form well-organized films, one molecule in thickness. Tables, graphs, and diagrams.

4232* Cathodic Protection Checks Water Ills. Sheppard T. Powell. *Power*, v. 96, Mar. 1952, p. 71-73, 202, 204, 206, 208.

Analyzes the principle of cathodic protection of metals and evaluates methods, giving advantages and precautions.

4233* Metallic Corrosion. W. H. J. Vernon. *Research*, v. 5, Feb. 1952, p. 54-61.

Principles of the above are broadly surveyed with special reference to the controlling factors in immersed, underground, and atmospheric corrosion and their application to the prevention of corrosion under service conditions.

4234* Micrographic Study of the Oxidation of Iron and of the Transformations of Iron Protoxide. (In French.) G. Chaudron and R. Collongues. *Revue de Métallurgie*, Dec. 1951, p. 917-922; disc., p. 922.

Presents results of study of formation of FeO on the surface of the metal, also its decomposition into Fe_3O_4 and Fe. Separate sections deal with laboratory method for preparation of the oxide layer; constitution and mode of formation of the oxide film; and decomposition of the protoxide. Excellent photomicrographs.

4235* The Oxidation of Metals in an Artificial Atmosphere. (In Dutch.) C. H. Luiten. *Smit Mededelingen*, v. 6, Oct.-Dec. 1951, p. 122-126.

Shows that oxidation of metals in a controlled atmosphere will take place if the dissociation pressure of the metal-oxide is smaller than the O_2 pressure of the surrounding atmosphere. Also, in so-called O_2-free atmospheres, a certain amount of O_2 exists which may be calculated from the equilibrium data of the dissociation of CO_2 or H_2O. The O_2 pressure appears to depend on and to vary with the square of the CO_2-CO or H_2O-H_2 ratios. Therefore, in an atmosphere containing CO_2, CO, H_2O, and H_2, these ratios are not independent. Some practical conclusions are given.

4236* Effect of Wetting Agents on Corrosion Resistance. II. Effect of Non-Ionic Wetting Agents. (In German.) Luigi Piatti. *Werkstoffe und Korrosion*, v. 2, Dec. 1951, p. 441-444.

Non-ionic wetting agents are shown to be more effective than ionic wetting agents in preventing the pitting effect of tap water and in removing tuberculation from steels. Tables and graphs show effect of type and concentration of wetting agent and of time of exposure. Includes photomicrographs.

4237* Chemical Reactions in Central Hot-Water Supply Systems. (In German.) Gunther Seelmeyer. *Werkstoffe und Korrosion*, v. 2, Dec. 1951, p. 448-456.

Years of experimentation reveal that the material of hot-water systems continuously react with the circulating water, and that the effect of chemical reactions depends not only on temperature but also on all other operating conditions. Describes methods of inhibiting formation of rust, sludge, and oxide scale. Data are tabulated.

4238* Problems of Acceptance and Supervision of Chemical Apparatus With Respect to Materials of Construction. (In German.) Kurt Richard. *Werkstoffe und Korrosion*, v. 2, Dec. 1951, p. 457-461.

Shows that reliability and safety require the testing of apparatus exposed to the effects of chemicals and heat, especially since these two factors frequently reduce strength and chemical resistance of initially satisfactory materials. Methods of testing are described and illustrated. Materials of construction include carbon and various alloy steels. Micrographs and graphs.

4239* Chemical Problems in the High-Pressure Power Plant. (In German.) Kurt Wickert. *Werkstoffe und Korrosion*, v. 3, Jan. 1952, p. 17-29.

Discusses numerous factors, including salt, CO_2, O_2, high-temperature corrosion, stress corrosion, etc., to be considered in designing high-pressure power plants and use of the Benson boiler. Includes diagrams, photographs, photomicrographs, graphs, and tables.

4240* Behavior of Cr-Ni Steels in Sulfuric Acid. (In German.) *Werkstoffe und Korrosion*, v. 3, Jan. 1952, p. 31-34.

Brief factual discussion includes extensive tables and graphs.

Miscellaneous Publications

4241 Corrosion of Magnesium Alloy ZK60A in Marine Atmosphere and Tidewater. Fred M. Reinhart. National Advisory Committee for Aeronautics, Technical Note 2632, Feb. 1952, 10 pages. (TL570 Un3t)

An investigation on the above showed that the unprotected alloy was so rapidly attacked in tidewater that it would be of no practical value in applications subject to sea-water exposure. In a marine atmosphere, rate of corrosion was much less. Here, the alloy should give good service if adequately protected. Data are tabulated. Micrographs.

See also:
4028 (atmospheric corrosion of painted Al alloys)
4031 (phosphate coating vs. galvanizing)
4167 (corrosion resistant Ni alloy)
4398 (corrosion by chemicals)

15. ANALYSIS—CHEMICAL AND PHYSICAL

4242* Determination of Copper by Dithizone in a Homogenous Acetone Solution. (In French.) Robert Delavault and Ruth Irish. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Dec. 19, 1951, p. 1614-1615.

Discusses above method, pointing out difficulties encountered in some cases, modifications of procedure, and other applications of dithizone in analytical work.

4243* Contribution to the Kjeldahl Method in the Presence of Selenium Oxychloride: The Cases of Quinoline and Quinaldine. (In French.) Claude Moreau. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Dec. 19, 1951, p. 1616-1617.

Describes modified method developed for application to nitrogen determination in the presence of the above compounds. Comparative data indicate optimum conditions for accurate results.

4244* New Method of Determining Oxygen in Coals. (In French.) Henri Guérin and Marthe Bastick. *Comptes Rendus hebdomadaires des Séances de l'Academie des Sciences*, v. 234, Jan. 7, 1952, p. 218-220.

Describes new direct procedure for the above. It involves heating in a vacuum at 1000°C., cracking of the resulting products on silica, and measurement of H_2O, CO_2, and CO produced. This method makes it possible to follow the liberation of O_2 as a function of temperature and furnishes interesting information on the composition of coals.

4245* Use of a Skeleton-Type Nickel Catalyst for the Quantitative Determination of Aromatic Nitro Compounds. (In Russian.) A. K. Ruzhentseva and N. S. Goriacheva. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 11, 1951, p. 849-852.

Catalytic reduction was used for the quantitative analysis of nitro compounds. Data are discussed and tabulated for 14 different examples.

4246* Inorganic Chromatography on Cellulose. Part VII. The Determination of Thorium in Monazite and of Thorium and Uranium in Uranothorianite. N. F. Kember. *Analyst*, v. 77, Feb. 1952, p. 78-85.

15. *Analysis—Chemical and Physical*

4247* The Determination of Copper in Steel by Internal Electrolysis. D. L. Carpenter and A. D. Hopkins. *Analyst*, v. 77, Feb. 1952, p. 86-89.

To determine Cu in carbon steels, the sample is dissolved in a dilute H_2SO_4-HCl mixture. The method is as accurate as the routine iodometric method and takes less time to complete. 11 ref.

4248* The Photometric Determination of Aluminum in Magnesium Alloys by Means of Solochrome Cyanine-RS. A. Bacon. *Analyst*, v. 77, Feb. 1952, p. 90-97.

Describes the above. Interference by Zn, Ni, Mn, and Cd is negligible; Cu and Fe interference is discussed in detail. Determination of Al in the presence of phosphate is also described. For alloying additions in the ranges stated, the method has an accuracy of ±1% of the maximum of the Al range covered. With metal containing less than 0.025% Al, the results are reproducible to ±0.0005%.

4249* The Preparation of Standard Solutions of Aluminum and Zinc, and of Certain Other Metals. L. S. Theobald, J. P. Stern. *Analyst*, v. 77, Feb. 1952, p. 99-101.

Describes the above. Method is based on attack of the metal by liquid Br.

4250* The Determination of Thorium and Its Separation From the Rare Earths by Means of Benzoic Acid. M. Venkataramaniah, C. Lakshman Rao, and Bh. S. V. Raghava Rao. *Analyst*, v. 77, Feb. 1952, p. 103-105.

10 references.

4251 4th Annual Review of Analytical Chemistry. *Analytical Chemistry*, v. 24, Feb. 1952, p. 232-300.

Includes 9 articles which review recent literature in specific fields of application: (Fundamental developments were reviewed in the Jan. issue.) "Coatings," T. G. Rochow and R. W. Stafford; "Food," John R. Matchett and Harry W. von Loesecke; "Solid and Gaseous Fuels," Hayes T. Darby; "Ferrous Metallurgy," H. F. Beeghly; "Nonferrous Metallurgy," M. L. Moss; "Petroleum," Harry Levin; "Pharmaceuticals and Natural Drugs," Max M. Marsh and Wayne W. Hilty; "Natural and Synthetic Rubbers," Norman Bekkedahl; "Water Analysis," S. K. Love and L. L. Thatcher. 1755 ref.

4252 Titrations in Nonaqueous Solutions. *Analytical Chemistry*, v. 24, Feb. 1952, p. 300-311.

Includes the following articles: "Potentiometric Titration of Salts of Organic Bases in Acetic Acid," Charles W. Pifer and Ernest G. Wollish; "Titration of Certain Salts as Acids in Nonaqueous Solvents," James S. Fritz; "Determination of Sulfa Drugs and Sulfonamides," James S. Fritz and Robert T. Keen; and a round-table discussion—John A. Riddick, moderator; and James S. Fritz, Marion McClean Davis, E. F. Hillenbrand, Jr., and P. C. Markunas, panel members. 45 ref.

4253 Correlation of Infrared Spectra; Paraffins, Olefins, and Aromatics With Structural Groups. H. L. McMurry and Vernon Thornton. *Analytical Chemistry*, v. 24, Feb. 1952, p. 318-342.

The above investigation was undertaken to improve the reliability and convenience of structural analyses of hydrocarbons by infrared spectra, and to provide factual data as an aid in understanding the vibrational origins of certain bands. Data are tabulated and charted. 16 ref.

4254 Precision Colorimetry. C. F. Hiskey and David Firestone. *Analytical Chemistry*, v. 24, Feb. 1952, p. 342-347.

Presents a general method of improving precision in multicomponent spectrophotometry, and some practical consequences thereof. 13 ref.

4255 Freezing Points in Determination of Product Purity. C. R. Witschonke. *Analytical Chemistry*, v. 24, Feb. 1952, p. 350-355.

Shows that freezing and melting points can be used for quantitative analysis of materials of lower purity than generally realized. The cryoscopic method of analysis is briefly, but critically reviewed on this basis. Possible sources of error are discussed, and some applications of the method to industrial products are presented. A versatile, automatic, freezing-point apparatus is described. 10 ref.

4256 Qualitative Separations by Two-Way and Three-Way Electrochromatography. Harold H. Strain. *Analytical Chemistry*, v. 24, Feb. 1952, p. 356-360.

19 references.

4257 Analysis of Mixtures of Carboxylic Acids by Spectrophotometric Determination of Rate of Reaction With Diphenyldiazomethane. John D. Roberts and Clare McC. Regan. *Analytical Chemistry*, v. 24, Feb. 1952, p. 360-362.

4258 Determination of Carbon, Oxygen, and Sulfur in Copper; Vacuum Fusion Analysis Using the Mass Spectrometer. W. M. Hickam. *Analytical Chemistry*, v. 24, Feb. 1952, p. 362-366.

10 references.

4259 Analytical Applications of the Polarography of Molybdenum. Marvin G. Johnson and Rex J. Robinson. *Analytical Chemistry*, v. 24, Feb. 1952, p. 366-369.

Characteristics of the polarographic reduction waves of acidified molybdate solutions, with or without nitrate present, are described. Procedures are outlined for polarographic determination of molybdate and nitrate. 11 ref.

4260 Determination of Nitrogen; Modified Kjeldahl Procedure Using Thiosalicylic Acid. Philip McCutchan and Walter F. Roth. *Analytical Chemistry*, v. 24, Feb. 1952, p. 369-370.

Thiosalicylic acid is used to assist the conversion of oxidized N to NH_3. This modification extends the scope of the method and gives greater assurance of obtaining accurate values on samples of unknown history. It is eminently suited for control operations, as some 20 determinations can be made per man-day.

4261 2,9-Dimethyl-1, 10-Phenanthroline; New Reagent Specific in Spectrophotometric Determination of Copper. G. Frederick Smith and W. H. McCurdy, Jr. *Analytical Chemistry*, v. 24, Feb. 1952, p. 371-373.

4262 Precision of a Simple Flame Photometer. John U. White. *Analytical Chemistry*, v. 24, Feb. 1952, p. 394-399.

To improve the ease and accuracy of Na and K determinations in biological samples, a simple flame photometer was built employing glass and interference filters, photovoltaic cells, and a galvanometer. Its air-gas flame is completely enclosed to prevent atmospheric contamination. Results obtained with this photometer are discussed.

4263 Determination of Microgram Quantities of Sulfide Sulfur. Boleslaw L. Dunicz and Terkel Rosenqvist. *Analytical Chemistry*, v. 24, Feb. 1952, p. 404-406.

A volumetric method based on the oxidation of H_2S into SO_4 by means of alkali hypochlorite was investigated. Studies discussed show that this reaction is influenced by pH and temperature of the hypochlorite solution. The method can be used for determining S whenever it is present as H_2S or can be converted into it.

4264 Determination of Free Carbon in Atmospheric Dust. Robert McCarthy and Carl E. Moore. *Analytical Chemistry*, v. 24, Feb. 1952, p. 411-412.

Describes the method used, and presents results obtained.

4265 Rapid Volume and Concentration Calculations in Industrial Air Analysis. Paul W. Mullen. *Analytical Chemistry*, v. 24, Feb. 1952, p. 417-418.

Describes a slide rule designed to correct gas volumes to 25°C. and 760 mm. Hg with accurary sufficient for industrial control purposes. The design may easily be altered to allow correction to any temperature and pressure desired. In addition, the method may be adapted to calculations relating ppm. by volume of most industrial air contaminants retained after sampling in an absorbing medium, to volume of standard reagent used to titrate.

4266 Ascorbic Acid in Analytical Chemistry. László Erdey and Endre Bodor. *Analytical Chemistry*, v. 24, Feb. 1952, p. 418-420.

Discusses a method for direct analytical application of ascorbic

acid; freshly prepared ascorbic acid solution is used for potentiometric determination of ferric ions.

4267* The Oxidation of the Tolyl-Anthranilic Acids. (In English.) M. Lederer and F. L. Ward. *Analytica Chimica Acta*, v. 6, Jan. 1952, p. 1-6.

Shows that, of the 3 tolyl-anthranilic acids, the ortho acid is the only one suitable as a redox indicator, its oxidation being reversible and yielding a relatively stable product.

4268* The Use of Chromotropic Acid for the Determination of Traces of Titanium. (In English.) T. C. J. Ovenston, C. A. Parker, and C. G. Hatchard. *Analytica Chimica Acta*, v. 6, Jan. 1952, p. 7-22.

Optimum conditions governing the use of chromotropic acid for the spectrophotometric determination of Ti were worked out. The extinction was measured at 420mμ after adjustment of pH to about 6.2. Procedures are described for Ti concentrations up to 2μg. per ml. 15 ref.

4269* Analytical Studies Concerned With the Reactions Between Organic Peroxides and Thioethers. III Analysis of Mixtures of Peroxides and Sulphoxides. (In English.) D. Barnard and K. R. Hargrave. *Analytica Chimica Acta*, v. 6, Jan. 1952, p. 23-27.

4270* Titration of Sulfate to Maximum Turbidity. Semimicro Determination of Total Sulfur in Vulcanized Rubber Mixtures. (In German.) Horst Frey. *Analytica Chimica Acta*, v. 6, Jan. 1952, p. 28-30.

Sulfate ion can be titrated with BaCl solution to maximum turbidity with the help of a photoelectric colorimeter. A rapid method which utilizes this principle for the determination of total S in vulcanized compounded rubber is described.

4271* Determination of Various Forms of Zinc (Zn Metal, Oxide, Sulfide, Silicate, Ferrite, and Aluminate) Present in Zinciferous Ores. (In French.) E. Frenay, R. Collée, and H. Grodent. *Analytica Chimica Acta*, v. 6, Jan. 1952, p. 31-41.

Describes method for the quantitative determination of various Zn compounds in complex products containing Zn. The principle of the method consists of the selective and successive dissolution of the different Zn compounds and determination, by the usual methods, of the Zn in each of the filtrates thus obtained.

4272* Desiccator Data. (In English.) G. Frederick Smith, D. N. Bernhart, and V. R. Wiederkehr. *Analytica Chimica Acta*, v. 6, Jan. 1952, p. 42-46.

Time rate of dehydration of air in laboratory desiccators was determined by direct measurement of residual moisture at given time intervals, using the commonly employed desiccants $Mg(ClO_4)_2 \cdot BaO$, and $CaSO_4 \cdot \frac{1}{2}H_2O$ H_2O. Results are tabulated and discussed.

4273* Thermogravimetric Determination of Analytical Precipitates. (In French.) **LVI. Determination of Copper.** Yvette Marin and Clément Duval. **LVII. Determination of Columbium.** Ursula M. Doan and Clément Duval. *Analytica Chimica Acta*, v. 6, Jan. 1952, p. 47-83.

Part LVI presents results of evaluation, with the Chevenard thermobalance, of 67 different precipitates which have been proposed for gravimetric determination of Cu. Recommends methods which, in the authors' opinion, are most suitable for automatic determination of the metal. In particular, the oxidation of the metal in finely divided form and the behavior of basic substances which give rise to $Cu(OH)_2$ were studied. Includes simple method for preparation of cupric sulfide and cupric thiocyanate. In Part LVII, pyrolysis curves are presented for 6 precipitates used in gravimetric determination of Cb. None seem to have any particular advantages; nor can they be recommended for automatic determination. 81 ref.

4274* Some General Aspects of Fluorimetric Determinations. (In English.) H. Braunsberg and S. B. Osborn. *Analytica Chimica Acta*, v. 6, Jan. 1952, p. 84-95.

Summarizes some of the factors which must be considered in order to choose the best possible conditions for fluorimetric determinations. 15 ref.

4275* Analytical Applications of Gossypol. II. Its Application to Determination of Molybdenum. (In German.) Agustin Vioque-Pizarro. *Analytica Chimica Acta*, v. 6, Feb. 1952, p. 105-111.

Gives details of the above, as applied to very dilute solutions of Mo^{+6}. Irregularities of the reaction and methods of correction are discussed.

4276* Determination of Mercury (II) by Means of Cupric Iodide. (In German.) E. Van Dalen and B. Van't Riet. *Analytica Chimica Acta*, v. 6, Feb. 1952, p. 101-104.

4277* Critical Study of the Quantitative Determination of Sulfate. (In German.) Horst Frey. *Analytica Chimica Acta*, v. 6, Feb. 1952, p. 126-132.

The $BaSO_4$ method was evaluated. Data are tabulated and discussed. 39 ref.

4278* Thermogravimetric Determination of Analytical Precipitates. (In French.) **LVIII. Determination of Tantalum.** U. Marly Doan and Clément Duval. **LIX. Determination of Rhenium.** Suzanne Tribalat and Clément Duval. *Analytica Chimica Acta*, v. 6, Feb. 1952, p. 135-141.

Part LVIII presents Chevenard-thermobalance pyrolysis curves for 4 precipitates used for gravimetric determination of Ta. The tartaric acid method is recommended. In Part LIX, 6 curves are presented for gravimetric Re precipitates. Only the tetraphenylarsonium perrhenate method of Willard and Smith is recommended for automatic determination of Re. 14 ref.

4279* Colorimetric Determination of Titanium in Steels in the Presence of Vanadium by Means of Chromotropic Acid. (In French.) R. Rosotte and E. Jaudon. *Analytica Chimica Acta*, v. 6, Feb. 1952, p. 149-156.

The influence of different factors on the formation of colored complex salts of Ti with chromotropic acid was studied. The influence of Fe was eliminated by electrolyzing with a mercury cathode; V has no effect. Results obtained with a typical sample are presented.

4280* Spectrophotometric Analysis and Its Application in Ferrous Metallurgical Analysis. (In French.) M. Jean. *Analytica Chimica Acta*, v. 6, Feb. 1952, p. 157-189.

Describes a spectrophotometer for colorimetric analysis in monochromatic light; and its application to determination of the following elements in steel and iron: Mn, Si, P, Cu, Ni, Cr, Mo, W, Co, Ti, V, and Pb. 35 ref.

4281* Electrolytic Titration Without External Source of Electricity. Determination of Acids and Sulfur and Electrolytic Reduction of Manganese, Chromium, and Vanadium. (In German.) W. Oelsen, H. Haase, and G. Graue. *Angewandte Chemie*, v. 64, Feb. 7, 1952, p. 76-81.

Shows that an external source of electricity and complex current-stabilizing apparatus can be dispensed with when the required electricity is generated directly by the electrolyte. The current intensity can readily be controlled by changing the depth of immersion of the zinc electrode. Diagrams, graphs, and tables.

4282 Errors In Blast Furnace Slag Analysis and Their Elimination. E. T. Saxer and E. W. Jones. *Blast Furnace and Steel Plant*, v. 40, Feb. 1952, p. 208-214.

A detailed discussion of the above presenting specific methods for analysis. Includes tabular data.

4283* Radioassay of Potassium in Solid Samples. O. J. Russell. *British Journal of Applied Physics*, v. 3, Feb. 1952, p. 47-50.

Powdered samples were assayed for potassium by the use of a Geiger counter designed for liquid samples. With precautions, the statistical accuracy expected in considerations of counting random events is achieved satisfactorily. Good sensitivity and accuracy are attained without long counting periods.

4284 A Review of Phenol Analysis. Part I. Qualitative: Colorimetric (Organic Reagents.) *Chemical Age*, v. 66, Feb. 23, 1952, p. 301-304.

Methods described are classed as follows: colorimetric, physicochemical and miscellaneous. 21 ref.

15. *Analysis—Chemical and Physical*

4285* Advances in Organic Micro-Analysis, Especially in Determining Functional Groups. (In German.) Hans Lieb. *Chimia*, v. 6, Feb. 15, 1952.

Discusses briefly each of a great variety of analytical procedures developed by different scientists.

4286* A Rapid Method for the Determination of Magnesium in Nickel Plating Solutions, Using Disodium Ethylene Diamine Tetra Acetate. K. E. Langford. *Electroplating and Metal Finishing*, v. 5, Feb. 1952, p. 41-46.

4287 Some Recent Advances In Chromatography. Arne Tiselium. *Endeavour*, v. 11, Jan. 1952, p. 5-16.

Discusses the underlying principles of chromatographic analysis. Particular stress is laid on the various methods of developing chromatograms. Presents quantitative studies on charcoal columns. 28 ref.

4288* Mass Spectrometry as an Aid to Chemical Analysis. (In German.) Horst Luther and Ludolf Jenckel. *Erdöl und Kohle*, v. 5, Jan. 1952, p. 17-24.

Design and use of the mass spectrometer are described and illustrated; experimental data are graphed and tabulated. 39 ref.

4289* Determination of Silicon in Steel by a Volumetric Method. (In Czech.) Jan Koresky and Bohdan Kysil. *Hutnické Listy*, v. 6, Nov. 1951, p. 541-544.

In the method described, Si is precipitated as potassium fluosilicate. Up to 5% Al has no influence on precision of the method. 11 ref.

4290* Analytical Methods of Determining Gases and Nonmetallic Inclusions in Steel. (In Czech.) Miroslav Sicha. *Hutnické Listy*, v. 6, Dec. 1951, p. 590-593.

Analytical methods are described for determining amounts of H_2, N_2 and O_2 in steels. Micro-analytical methods were used for nonmetallic inclusions. Vacuum extraction at 1650°C. was used for gaseous analyses. Data are tabulated. 24 ref.

4291 The Determination of Moisture in Coal Using the Karl Fischer Reagent. A. Bryson and W. F. Pickering. *Journal of the Institute of Fuel*, v. 25, Jan. 1952, p. 28-30.

15 references.

4292 The Identification of Metals and Alloys by Chemical Spot Testing. C. T. Wilshaw. *Metallurgia*, v. 45, Feb. 1952, p. 102-106.

The spot-testing procedures described were developed for identification of materials rather than for detection of the presence of a particular element. The scheme covers ferrous materials and those nonferrous alloys not readily separated from them by density or color.

4293* Recent French Contributions to Gas Analysis of Iron and Steel Products. (In French.) E. Jaudon. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 840, 843, 845, 871.

Discusses recent methods for determining O_2, H_2, and N_2 in the above. Includes photographs, tables, and diagrams. 25 ref.

4294* Equilibrium States and Theory of Combustion of the Method of Dumas for the Determination of Nitrogen. (In English.) Sheau-Shya Kao and W. C. Woodland. *Mikrochemie vereinigt mit Mikrochimica Acta*, v. 38, no. 4, 1951, p. 309-327.

Eleven equilibria involving compounds of Cu, N, C, H, and O, important in the Dumas method of determination of N, were thoroughly studied. Results are tabulated, charted and discussed. 18 ref.

4295* Concentration and Spectrographic Determination of the Trace Metals. II. Ashing the Sample and Separating the Trace Metals From Interfering Iron. III. (In German.) G. Gorbach and F. Pohl. *Mikrochemie vereinigt mit Mikrochimica Acta*, v. 38, no. 4, 1951, p. 328-341.

Presents complete details of a system for the above. Includes tables, graphs, and spectrograms. 17 ref.

4296* Inorganic Paper-Chromatographic Separation on a Microgram Scale: Aluminium, Uranium, Iron. (In French.) A. Lacourt, Gh. Sommereyns, and J. Soete. *Mikrochemie vereinigt mit Mikrochimica Acta*, v. 38, no. 4, 1951, p. 348-357.

Presents details of experimental development of procedures for the above, including influence of various organic solvents.

4297* Selective Determination of Different Forms of Nitrogen by a Micro-Kjeldahl Method. (In German.) Margherita Marzadro. *Mikrochemie vereinigt mit Mikrochimica Acta*, v. 38, no. 4, 1951, p. 372-375.

By application of the Dumas-Zimmermann procedure and a modified Kjeldahl method, it was possible to make a selective determination of the various forms of nitrogen in heterocyclic compounds. On the basis of the findings, which were obtained on one hand with pyridine, quinoline, and isoquinoline compounds, and with hydrogenated ring systems on the other, several rules were set up limiting the field of application of the procedure.

4298* Contributions to the Micro-Analysis of Gaseous Substances. II-III. (In German.) H. Malissa, A. Musil, and R. Kreibich. *Mikrochemie vereinigt mit Mikrochimica Acta*, v. 38, no. 4, 1951, p. 385-412.

In Part II, the apparatus described earlier was used in a critical study of reactions recommended in the literature for NH_3, H_2S, and the hydrides of As, Sb, and P. Part III describes a method which permits detection, one after the other, of NH_3, As(III), As(V), and Sb in the presence of each other. Another publication which deals with the detection of gaseous reaction products is critically examined; its inadequacies are pointed out. 14 ref.

4299* Micropreparation of Derivatives for the Identification of Organic Compounds. (In English.) Nicholas D. Cheronis and Alexander Vavoulis. *Mikrochemie vereinigt mit Mikrochimica Acta*, v. 38, no. 4, 1951, p. 428-443.

A systematic study of preparation of alcohol derivatives, by means of the 3,5-dinitrobenzoates and α-naphthylurethans using micro-quantities, discloses that a number of factors must be controlled for good yields of pure derivatives: purity of the agent; ratio of the reactants; and procedure for isolation and purification of the compound. Data are tabulated; apparatus is illustrated. 51 ref.

4300* Paper-Chromatographic Separation and Determination of Anions on a Microgram Scale: Silicon, Boron, and Molybdenum. (In French.) A. Lacourt, Gh. Sommereyns, and M. Claret. *Mikrochemie vereinigt mit Mikrochimica Acta*, v. 38, no. 4, 1951, p. 444-455.

Describes development of satisfactory procedure for the above. Data are tabulated.

4301* A Modification of the Parr Bomb Method for the Combustion of Petroleum Products. (In English.) Anne L. Conrad. *Mikrochemie vereinigt mit Mikrochimica Acta*, v. 38, no. 4, 1951, p. 514-520.

Describes method developed for the above. The sample is enclosed in a gelatine capsule together with a limited amount of Na_2O_2-KNO_3 accelerator mixture. Standard procedures were used for determination of various elements in the washings. Samples of lubricating-oil additives, asphaltenes, and engine deposits were rapidly and completely oxidized. 16 ref.

4302* Use of Stainless Steel Absorption Tubes for the Semimicro Carbon-Hydrogen Combustion. (In English.) J. A. Kuch and Mignal Arnold. *Mikrochemie vereinigt mit Mikrochimica Acta*, v. 38, no. 4, 1951, p. 521-531.

A temporary shortage of soft-glass absorption tubes made it necessary to see if stainless-steel ones could not be substituted in the C-H semimicro combustion. Absorption tubes were made up from stainless steel into two types, semimicro and micro, and were tested in routine analysis. A series of 14 determinations was made on each of 3 test substances using metal tubes and on 2 of the same samples using soft-glass tubes. Statistical analysis of the variance appearing in each series of runs shows no significance at the 5% level in carbon precision among the 3 compounds. There was also no significant difference at the 5% level in the precision obtained with either stainless-teel or soft-glass absorption tubes when either C or H was being determined. A series of 14 semimicro combustion analyses was also made on one of 3 test samples using microsize absorption tubes. Comparison of the variance showed no significant difference at the 5% level.

4303* Identification of Troublesome Materials in Deinking Systems. A. H. Nadelman. *Paper Trade Journal*, v. 134, Feb. 29, 1952, p. 27-28.

A workable approach to the above problem is presented.

4304 Analysis From Gases to Waxes by Mass Spectrometry. R. A. Brown, F. W. Melpolder, and W. S. Young. *Petroleum Processing*, v. 7, Feb. 1952, p. 204, 206-207, 209, 211.

Presents various specific applications where the mass spectrometer has played a major part. Data are tabulated.

4305 Analytical Methods for the Determination of Cyanides in Plating Wastes and in Effluents From Treatment Processes. Earl J. Serfass, Robert B. Freeman, Barnett F. Dodge, and Walter Zabban. *Plating*, v. 39, Mar. 1952, p. 267-273.

Provides electroplaters with reliable and reasonably simple methods for the above. The 2 methods recommended were selected from an experimental investigation of about 8 different methods given in the literature. They are intended to determine total cyanide, i.e., not only the cyanide present as the anion, CN^-, but also that present in various complexes with metals.

4306* New Analytical Method in Lead Metallurgy and Future Perspectives. (In French.) Niccolo Rossi Canevari. *Révue de Métallurgie*, Dec. 1951, p. 912-916; disc., p. 916.

Describes a polarographic method for analyzing Pb specimens obtained from the molten mass before casting; and use of Pb as protection against nuclear radiation. Includes polarograms and tables.

4307* Study of the Spectral Analysis of Highly Alloyed Steels. (In French.) J. Eeckhout, J. Cruse, and J. Gillis. *Revue Universelle des Mines, de la Metallurgie des Travaux Publics des Sciences et des Arts Appliqués a l'Industrie*, ser. 9, v. v. 94, Dec. 1951, p. 440-447.

After a short review of the possibilities of above method, an examination was made of conditions likely to furnish the best results. Optimum conditions of excitation were studied and supported by results of analyses checked by chemical methods for the different elements entering into the composition of steel. Includes tables and charts. 12 ref.

4308* A New Apparatus for Direct Spectrochemical Analysis. (In French.) A. Hans. *Révue Universelle des Mines, de la Metallurgie des Travaux Publics des Sciences et des Arts Appliqués a l'Industrie*, ser. 9, v. 94, Dec. 1951, p. 448-451.

Describes above, of Belgian construction. Presents results obtained on various steel samples. Excellent stability of the new instrument is emphasized. Circuit diagrams and tables.

4309* Methods for Analysis of Clinkers and Portland Cement. (In German.) F. Guye. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 18, Jan. 1952, p. 32-39.

Different methods for determining ingredients of above are described. Includes diagrams and tables.

4310 A New Reaction and Color Test for Allethrin and Pyrethins. Louis Feinstein. *Science*, v. 115, Feb. 29, 1952, p. 245-246.

Allethrin is a synthetic insecticide of a structure similar to that of the pyrethrins and is used in insecticide sprays and aerosol bombs to replace the natural pyrethrins.

4311* Ferrite Determination in Austenitic Stainless Steel. (In Dutch.) K. K. Zwart. *Smit Mededelingen*, v. 6, Oct.-Dec. 1951, p. 119-121.

Shows that the magnetic properties of an austenitic stainless steel depend on the amount of ferrite in it. Thus, the percentage of ferrite in such a steel can be ascertained by magnetic measurements. An apparatus for performing such measurements, consisting of a balance and an a.c. excited magnet, is described.

4312* The *Aspergillus Niger* Method for Determining Copper in Soils. Marjorie Welsh Dole. *Soil Science*, v. 73, Feb. 1952, p. 135-147.

Describes studies made to confirm and extend the bioassay method as employed by others, and to evaluate its use for various U. S. soil types. Various modifications in the techniques described by others were adopted for convenience and efficiency. A recommended procedure is given. 12 ref.

4313* Catalysis and Induction in Redox Titrations. (In German.) Alwin Schleicher. *Fresenius' Zeitschrift für analytische Chemie*, v. 134, no. 6, 1952, p. 419-426.

Shows that above can be explained by applying Ohm's law and the concept of induction. Includes tabular data.

4314* Determining Total Chromium Content in Waste Waters. (In German.) Albert Hansen. *Fresenius' Zeitschrift für analytische Chemie*, v. 134, no. 6, 1952, p. 427-429.

Points out certain deficiencies of the usual methods for the above. Describes colorimetric procedure using diphenyl carbazide solution which gives very accurate results.

4315* Methods of Determining Oxygen in Metals. (In German.) J. Fischer and H. Bechtel. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 5, Jan. 1952, p. 14-19.

Surveys literature and experimental results on the analysis of O_2 especially in Cu, Pb, Al, and Zn. Diagrams, graphs, and tables. 19 ref.

Miscellaneous Publications

4316 Method of Calculation of Feed Back Method of Analysis for C616 Composition. M. G. Inghram, B. M. Rustad, and M. Fox. U. S. Atomic Energy Commission, AECD-3271, Dec. 29, 1944, 15 pages. (UF767 Un3m)

Summarizes methods of calculation used to compute the separation of the isotopes of "C616" when measured on the mass spectrometer. One section deals with the manual operation of the mass spectrometer in which the readings are taken manually from a galvanometer. The second deals with the operation of the automatic recording spectrometer in which the readings are recorded on a recording potentiometer. A satisfactory equation for operation in any range of concentration of 234, 235, and 238 is presented.

Books

4317 Light Hydrocarbon Analysis; Specifications and Methods of Analyses. O. W. Burke, Jr., C. E. Starr, Jr., and F. D. Tuemmler, editors. 639 pages. 1951. Reinhold Publishing Corp., New York. (TP248.H9 C73L)

The above is concerned primarily with analytical control and specific phases of the manufacture and use of butadiene. Includes a study of the detailed analysis of numerous light hydrocarbons.

4318 Standard Methods of Analysis of Iron, Steel and Ferro-Alloys, Ed. 4. 169 pages. 1951. United Steel Companies, Ltd., Sheffield, England. (QD133 Un3s4)

Contains selected methods which were adopted and are actually in use as standards by the publishers. Major addition to this edition is a section dealing with physicochemical methods.

See also:

3842 (determination of Cu in Steel)
4023 (analysis of phosphate coatings on steel)
4333 (measurement of purity by freezing point)
4618 (Inorganic chlorides in fuel oils)
4666 (colloidal and dissolved silica in dusts)
4860 (radiation–absorption analysis)

16. APPARATUS, METHODS, AND STANDARDS

4319* Using Chlorinated Rubber as a Film Support for Samples in Electron Microscopy. (In French.) François Davoine and Émile Pernoux. *Comptes Rendus hebdomadaires des Séances de l'Académie des Science*, v. 233, Dec. 19, 1951, p. 1590-1591.

Briefly outlines two techniques for the above, and the satisfactory results obtained.

4320* Determination of the Shape and Dimensions of Carbon-Black Particles by Electron Miscroscopy. (In French.) Jean-Baptiste Donnet and Jacqueline Boissier. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 7, 1952, p. 195-198.

Shows that the above are little affected by electron bombardment during examination in the electron microscope. Includes micrographs. 13 ref.

16. *Apparatus, Methods, and Standards*

4321* Porosity of Some Adsorbent Materials. (In French.) André Chretien and Denis Papée. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 7, 1952, p. 214-216.

Differentiates between microporous and macroporous types. Reversibility of changes in structure of a silica gel was observed. Describes a rapid method for determining the micropore volume based on adsorption of organic vapors. Includes tables.

4322* Electron Multiplier for the Ultraviolet Region Up to 1450 A. (In French.) Vladimir Schwetzoff, Simone Robin, and Boris Vodar. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 21, 1952, p. 426-428.

Briefly describes the above apparatus. Includes rough spectral curve of the multiplier in response to a hydrogen lamp. (0.8 amp.).

4323* Asymmetric X-Ray Reflections and Abraded Crystals. (In English.) P. Gay, P. B. Hirsch, and J. N. Kellar. *Acta Crystallographica*, v. 5, Jan. 1952, p. 7-11.

Intensities of X-ray reflection from abraded crystals were measured as a function of asymmetry and surface treatment. Results are explained in terms of surface imperfections, evidence for which was found by electron diffraction as well as by X-ray diffraction methods. Importance of the results in relation to the use of plane-crystal monochromators is discussed. It is also shown that, under certain conditions, integrated reflections can be measured from stationary crystals. 11 ref.

4324* Physical Properties of Crystals: The Direct-Inspection Method. (In English.) Fausto G. Fumi. *Acta Crystallographica*, v. 5, Jan. 1952, p. 44-48.

A tensorial treatment. 18 ref.

4325* Crystal-Structure Determination by Means of a Statistical Distribution of Interatomic Vectors. (In English.) H. Hauptman and J. Karle. *Acta Crystallographica*, v. 5, Jan. 1952, p. 48-59.

The structure-factor equations are interpreted as coupled, closed-vector polygons. This interpretation permits the application of the random-walk problem to yield the probability distribution of the structure factors and of the coordinate differences between specified pairs of atomic centers in the case of rigid crystals. 16 ref.

4326* The Squaring Method: A New Method for Phase Determination. (In English.) D. Sayre. *Acta Crystallographica*, v. 5, Jan. 1952, p. 60-65.

A new set of relationships is given which exist among the structure factors of crystals composed only of like atoms and which hold approximately for ordinary organic crystals containing only C, N, O, and H. 11 ref.

4327* A Relation Between the Signs of Structure Factors. (In English.) W. Cochran. *Acta Crystallographica*, v. 5, Jan. 1952, p. 65-67.

By considering the extent to which a partial Fourier series, which contains as coefficients only a few of the larger structure factors, will represent the electron density in a crystal structure, and using the relations between the structure factors of an electron distribution and those of the square of this distribution, a probable relation between the signs of structure factors is deduced.

4328* A New Analytical Method for Solving Complex Crystal Structures. (In English.) W. H. Zachariasen. *Acta Crystallographica*, v. 5, Jan. 1952, p. 68-73.

A new procedure for determination of crystal structures with many degrees of freedom is developed and described. The discussion is restricted to centro-symmetrical crystals.

4329* Investigation of Degassing Processes With Automatic Recording of the Volume of Gases by Means of the Kurnakov Pyrometer. (In Russian.) L. G. Berg and B. Ia. Teitelbaum. *Doklady Akademii Nauk SSSR*, new ser., v. 74, Aug. 11, 1951, p. 791-794.

The recording equipment to be used with the above pyrometer is described. Typical charts are shown and discussed.

4330* Analysis of Magnetic Flux Changes Using Fluxmeters Connected in Parallel. (In Russian.) A. G. Kalashnikov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 11, 1951, p. 743-746.

A system using two or more fluxmeters in parallel to measure weak magnetic fields is described. Charts and tables.

4331* One Optical Method of Controlling the Character of an Acoustic Field. (In Russian.) G. P. Motulevich and I. L. Fabelinskii. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 11, 1951, p. 787-790.

The use of an interference filter for control of acoustic fields was investigated. Data are discussed and charted. Includes mathematical development.

4332 Apparatus for Differential Thermal Analysis Under Controlled Partial Pressures of H_2O, CO_2 or Other Gases. Robert L. Stone. *Journal of American Ceramic Society*, v. 35, Mar. 1, 1952, p. 76-82.

Describes and diagrams above in which the composition of the atmosphere around the particles of powder being studied can be controlled both before and during a reaction.

4333 Thermistors for Cryoscopy of Air-Sensitive Materials. Paul D. Zemany. *Analytical Chemistry*, v. 24, Feb. 1952, p. 348-350.

Describes a simple device used to measure the purity of compounds by their freezing points. It has a precision of ±0.004°C. 10 ref.

4334 Determination of Geometric Surface Area of Crushed Porous Solids. Sabri Ergun. *Analytical Chemistry*, v. 24, Feb. 1952, p. 388-393.

A gas-flow method for the above is described. The method, based on a fundamental flow equation, is used to automatically determine the particle density of porous solids and offers 2 alternative methods of mathematical analyses. Results are reported for numerous cokes of different origin and mesh sizes. 86 ref.

4335 The Application of Quality Control in Steel Operations, Ford Motor Company; Statistical Quality Control at the Rolling Mill. Part II. H. W. Clark. *Blast Furnace and Steel Plant*, v. 40, Feb. 1952, p. 201-207.

Describes and discusses methods established for realizing standards of quality performance.

4336* 31-MeV Radiographic Inspection of Metal Parts. *Brown Boveri Review*, v. 28, Sept.-Oct. 1951, p. 301-310.

Gives directions for the radiographic inspection of metal workpieces and shows, by means of practical examples, that the fault sensitivity and sharpness of definition of the radiographs obtained with 31-MeV X-rays are excellent. Radiographic technique is shown to be much simpler with 31-MeV radiation than with conventional X-ray inspection. Radiographs of iron parts are shown.

4337 Radioisotopes Aid Metallurgy, Part I. Gordon H. Guest. *Canadian Metals*, v. 15, Feb. 1952, p. 16-17.

Discusses the role of radioisotopes in the study of metals, their characteristics and application in diffusion processes, corrosion studies, steelmaking, flotation, and radiography. (To be continued.)

4338* New Methods of Dispersoid Analysis Suitable for Industrial Application. (In German.) O. Fuchs. *Chemie-Ingenieur-Technik*, v. 24, Jan. 1952, p. 25-31.

Reports work of 3 investigators who have developed simple forms of dispersoid analyses for industrial application. Two of these papers deal with the improvement or the simplification of methods already known which are based on the sedimentation of dispersoids in liquids or on measurement of permeability of accumulated material. The 3rd paper uses the dispersion of light in relationship to the particle size. By use of the appropriate optical equipment, it promises to make almost instantaneous measurements possible. Diagrams, graphs, tables, and illustrations. 11 ref.

4339* The Triodometer; A Universal Apparatus for Electrometric Analysis. (In German.) U. Ehrhardt. *Chemische Technik*, v. 3, Nov. 1951, p. 329-333.

Shows that the versatility of above instrument enables the

chemical analyst to use advanced methods of investigating a great variety of products, increasing their quality, and explaining numerous problems in industry and science. Illustrations and graphs are presented.

4340* Vacuum Control of Laboratory Distilling Equipment. (In German.) E. Krell. *Chemische Technik*, v. 3, Nov. 1951, p. 333-336.

Shows that two new pressure controls eliminate disadvantages of older pressure controls. In combination with other pressure controls, they can be used at pressures ranging from 1 to 760 mm. Hg with an accuracy of ±0.1 to ±0.5 mm. Hg. With an automatic pump and a buffer-vacuum control, energy consumption can be reduced as much as 97%. Includes diagrams and charted data. 13 ref.

4341* New Procedures for Electronic Nondestructive Testing of Materials. (In French.) D. F. Förster. *Metaux: Corrosion-Industries*, v. 26, Dec. 1951, p. 497-513.

Presents a brief study of the theoretical bases of electronic, nondestructive testing of materials with the aid of Foucault currents. Apparatus is described, diagrammed, and illustrated. Includes charts, sketches, and photographs.

4342 High-Speed Recorder. Leo Rosen. *Electronics*, v. 25, Mar. 1952, p. 162, 166, 170, 174.

Describes two essentially similar recorders for printing hard copy, one printing numbers only, the other printing 36 symbols. Applications and circuits are discussed.

4343* The Bifilar Pendulum for the Damping of Torsional Vibrations. (Concluded.) L. Devaux. *Engineers' Digest*, v. 13, Jan. 1952, p. 19-22. (Translated and condensed from *Revue Universelle des Mines*, v. 7, no. 8, Aug. 1951, p. 237-250.)

Previously abstrated from original.

4344* Problems of Fluid Measurement. M. Schatzmann. *Engineers' Digest*, v. 13, Jan. 1952, p. 15-16. (Translated and condensed from *Schweizerische Technische Zeitschrift*, Oct. 25, 1951, p. 747-751.)

Deals with the above and illustrates, by means of practical examples, the solution of such problems, as encountered in flowmeters, hydraulic systems, etc.

4345 Swedish Standards for Bronze and Red Brass Ingots. (In Swedish.) *Gjuteriet*, v. 41, Dec. 1951, p. 186-187.

4346* Soviet and Czechoslovakian Structural Steels. (In Czech.) Ladislav Jenicek. *Hutnické Listy*, v. 6, Nov. 1951, p. 531-537.

Stresses the importance of basic raw materials in the production and classification of alloy steels. Czech specifications are compared with Russian ones. Comparison is made vivid by graphical presentation.

4347* A Homopolar Tachometer for Servomechanism Application. Craig C. Johnson. *Proceedings of the I.R.E.*, v. 40, Feb. 1952, p. 158-160.

Design considerations, construction details, and performance data are presented for a small disk-type homopolar tachometer developed as a low-inertia, low-noise, low-friction-rate signal source for incorporation into a high-performance servomechanism. Performance characteristics reveal that a unit of this type has certain advantageous features which recommend it over conventional tachometers, although a low signal-output level is an inherent disadvantage.

4348* A Generalized Method for Analyzing Servomechanisms. Arthur A. Hauser, Jr. *Proceedings of the I.R.E.*, v. 40, Feb. 1952, p. 197-202.

By use of the algebra of dyadics a unification of d.c. and a.c. servo theory is obtained. The effects arising from the symmetry of the side bands in an a.c. (carrier-frequency) servo are automatically taken into account. In the case of a symmetrical side-band, carrier-frequency servo or a d.c. servo, the generalized operators introduced reduce to the ordinary transfer functions of the system components.

4349 Optimalizing System for Process Control. *Instruments*, v. 25, Feb. 1952, p. 190-193, 228.

Continued discussion on the above. Numerous diagrams. (To be continued.)

4350 New Tool Steels and Carbides. *Iron Age*, v. 169, Mar. 6, 1952, p. 228, 232-235, 238-240, 242, 244, 246, 248, 250, 252, 254, 256, 258-277.

A list of the newest tool materials—specifications of more than 400 toolsteels, die steels, and carbides introduced since 1949.

4351 Industrial Applications of Sonic Energy. C. Richard Soderberg, Jr. *Iron and Steel Engineer*, v. 9, Feb. 1952, p. 87-94; disc., p. 94-95.

Discusses the industrial applications of sonic equipment and the development required for this equipment to be used on an industrial scale. Sonic methods are proposed to clean open-hearth gases. They also show promise for other steelplant applications such as agitators for pickling. Illustrations and diagrams.

4352 The Size of Latex Particles by X-Ray Scattering. B. R. Leonard, Jr., J. W. Anderegg, Paul Kaesberg, and W. W. Beeman. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 152.

Discusses methods for use of the above particles as a calibration standard for electron microscopes. Use of small-angle X-ray scattering to determine particle diameter is described.

4353* Measurement of Instantaneous Vector Air Velocity by Hot-Wire Methods. Carl E. Pearson. *Journal of the Aeronautical Sciences*, v. 19, Feb. 1952, p. 73-82.

Details of the construction, theory, and use of the hot-wire instrument are presented. It has so far been examined only for Mach Numbers less than 0.7. For $M < 0.3$, an accuracy of better than 2% in average and 10% in instantaneous velocity is claimed; at $M = 0.7$, the error in instantaneous velocities measurement may be 25%.

4354 Direct Printing of Shadowed Electron Micrographs. R. M. Fisher. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 153-154.

Describes and illustrates above technique, which has been applied in metallography of steel.

4355 Design and Performance of a Photoelectric Circuit for Measurement of Streaming Birefringence and Dichroism. Donald Zucker, Joseph F. Foster, and Glenn H. Miller. *Journal of Physical Chemistry*, v. 56, Feb. 1952, p. 166-170.

Describes the above. This circuit permits the measurement of the positions of both minimum and maximum light absorption in dilute (less than 0.002%) solutions of amylose-iodine complex under conditions where direct visual measurement of the orientation position is impossible. Diagrams.

4356 Application of the Cathode-Ray Oscilloscope to Polarographic Phenomena. I. Differential Capacity of the Electrical Double Layer. II. Surface Charge Density of the Electrical Double Layer. J. West Loveland and Philip J. Elving. *Journal of Physical Chemistry*, v. 56, Feb. 1952, p. 250-258.

A detailed description of an electronic circuit was given whereby the differential capacity vs. potential curve may be obtained on the screen of an oscilloscope. The capacity current pattern consists of a charging current trace and a discharging current trace. Adsorption phenomena can be easily followed by the technique.

4357 Notes on the Design, Adjustment and Calibration of Spectrophotometers. Charles W. B. Normand and R. H. Kay. *Journal of Scientific Instruments*, v. 29, Feb. 1952, p. 33-39.

Techniques of calibration and adjustment of spectrophotometers, made possible by the high sensitivity of photomultipliers, together with some general principles of design, are illustrated with reference to the Dobson spectrophotometer for measurements in the near ultraviolet.

4358 A Bridge Circuit for Wire Resistance Strain Gauges. B. V. Hamon. *Journal of Scientific Instruments*, v. 29, Feb. 1952, p. 53-54.

Describes a strain-gage bridge circuit in which Waidner-Wolff adjustable resistance elements are used in the measuring arm. Use of this type of element has some advantages over the more usual slide-wire measuring element where both wide range and a high accuracy are required.

16. *Apparatus, Methods, and Standards*

4359 Dilastrain Method for Determining Endurance Limit of Materials. Joseph L. Rosenholtz and Dudley T. Smith. *Metal Progress*, v. 62, Feb. 1952, p. 85-88.

The principle of the above is that the coefficient of linear thermal expansion of materials decreases abruptly at the true endurance limit. Results with ferrous and nonferrous alloys are given.

4360* Automatic Gauging Devices. M. Fortier. *Microtechnic* (English Ed.), v. 5, Nov.-Dec. 1951, p. 317-320; disc., p. 321-322. (Translated from the French.)

Discusses new mechanical, electronic, and pneumatic devices and their qualities, advantages, and applications.

4361* How to Interpret the Quality of Antifriction Bearings. Hilding Törnebohm. *Microtechnic* (English Ed.), v. 5, Nov.-Dec. 1951, p. 387-393; disc., p. 394. (Translated from the French.)

Discusses the above and presents an outline of the checking procedure.

4362* High-Constant-Speed Rotating Mirror. J. W. Beams, E. C. Smith, and J. M. Watkins. *Journal of Motion Picture and Television Engineers*, v. 58, Feb. 1952, p. 159-168.

Describes the above magnetically suspended in a high vacuum and spun by a rotating magnetic field. The mirror is accelerated to full speed in a way similar to that of the armature in an induction motor; but, at running speed, it performs as an armature of a synchronous motor. Mirrors are described which rotate at 20,000 rps.

4363 Thickness of Glass Electrodes. J. J. Diamond and Donald Hubbard. *Journal of Research of the National Bureau of Standards*, v. 47, Dec. 1951, p. 443-448.

A magnetic method, employing iron powder, was developed for simple, rapid, and accurate determination of the thickness of glass electrode bulbs. The procedure has the additional advantage of not destroying the specimen. The method as given could be used with equal facility for thickness measurements on odd-shaped envelopes made of any nonmagnetic material. 22 ref.

4364 On the Derivation and Accuracy of Certain Formulas for Sample Sizes and Operating Characteristics of Nonsequential Sampling Procedures. Uttam Chand. *Journal of Research of the National Bureau of Standards*, v. 47, Dec. 1951, p. 491-501.

Formulas are given that are needed for the computation of number of observations and operating characteristics of single sample-acceptance sampling procedures based on tests of statistical hypotheses. 18 ref.

4365 A New Determination of the Velocity of Electromagnetic Radiation by Microwave Interferometry. K. D. Froome. *Nature*, v. 169, Jan. 19, 1952, p. 107-108.

Essentially, the apparatus used is equivalent to the Michelson optical interferometer. Microwave energy at constant frequency from a stabilized klystron oscillator is transmitted by means of a hybrid junction ("magic-T"), acting as beam divider, along the two arms of the interferometer.

4366* Photographic Protection Measurements With X-Rays, Gamma and Beta Rays. G. Spiegler. *Photographic Journal*, v. 91B, Nov.-Dec. 1951, p. 128-133.

Discusses the photographic method for the determination of stray doses from radioactive materials.

4367 A Numerical Variational Method. R. E. Meyerott, P. J. Luke, W. W. Clendenin, and S. Geltman. *Physical Review*, ser. 2, v. 85, Feb. 1, 1952, p. 393-400.

A procedure applicable to the solution of linear partial differential equations of 2nd order is described with special reference to an application to the calculation of the wave function for states of Li II.

4368 The Electrical and Luminous Characteristics of Short Air Sparks Suitable for High Speed Photography. W. G. Standring and J. S. T. Looms. *Proceedings of the Physical Society*, v. 65, sec. B, Feb. 1, 1952, p. 108-115.

The light emitted by various forms of spark gap is examined, and the factors affecting maximum value and variation with time are discussed. Measurements of the voltage drop across the spark help to explain the effects on light output of spark duration and form of spark gap. A rough spectral analysis is given for an open gap.

4369 Liquid Level Indicators and Controllers. H. W. Hamm. *Product Engineering*, v. 23, Mar. 1952, p. 140-141.

Thirteen different systems of operation are illustrated.

4370* Calibration Furnaces. Frances Mortimer. *Research*, v. 5, Feb. 1952, p. 82-85.

Describes two new furnaces designed for the calibration of total radiation pyrometers. Although intended primarily for steel works and laboratory use, the details of the construction of these furnaces should interest many industrial laboratories.

4371 Plain and Beaded Wire Geiger Counters for X-Rays. L. G. Parratt, C. F. Hempstead, and E. L. Jossem. *Review of Scientific Instruments*, v. 23, Jan. 1952, p. 1-7.

Calibrations of above were studied over a range of 1 to 10^5 counts per sec. Beaded-wire counters are an improved type of counter for incident-ionizing events whose primary ionization does not extend along a large fraction of the length of the anode wire. 14 ref.

4372 A High Vacuum Recording Spectrograph for the Study of Radiation From Solids in the 100-800A Range. E. R. Piore, G. G. Harvey, E. M. Gyorgy, and R. H. Kingston. *Review of Scientific Instruments*, v. 23, Jan. 1952, p. 8-12.

The 2-meter grazing-incidence vacuum spectrograph used by O'Bryan and Skinner for the study of the emission bands of solids was rebuilt to operate with improved sensitivity and speed. The major modification is replacement of the photographic plate by a Be-Cu photomultiplier designed to traverse the Rowland circle, giving a continuous record of photon-counting rate as a function of wavelength. 11 ref.

4373 Natural Radioactivity as a Tracer in the Sorting of Aerosols According to Mobility. M. H. Wilkening. *Review of Scientific Instruments*, v. 23, Jan. 1952, p. 13-16.

A method is described in which aerosols in the submicroscopic range are detected by means of their natural radioactivity. Knowledge of the sizes of the particles was obtained by mobility measurements. 11 ref.

4374 An Automatically Recording Magnetic Balance. Joseph D. Eisler, George R. Newton, and Willis A. Adcock. *Review of Scientific Instruments*, v. 23, Jan. 1952, p. 17-21.

Describes balance which uses an electromagnetic feedback to balance the force on a sample placed in a non-uniform magnetic field. This apparatus was used for quantitative determination of ferromagnetic phases present in iron hydrocarbon-synthesis catalysts and for studying reactions of gases with iron compounds. Typical data are presented.

4375 Multiple Mode Operation of Servomechanisms. Donald McDonald. *Review of Scientific Instruments*, v. 23, Jan. 1952, p. 22-30.

Describes controller which makes use of additional modes of operation to produce a servomechanism having improved response with less weight than those of servomechanisms designed for only one mode of operation. Design of this type of controller is discussed.

4376 On the Resolution of Short Time Intervals With Scintillation Counters. S. De Benedetti and H. J. Richings. *Review of Scientific Instruments*, v. 23, Jan. 1952, p. 37-39.

A simple coincidence circuit of resolving time of the order of 10^{-9} sec. is described. Performance tests showed that, when pulse-height distribution is constant during an experiment, this circuit can resolve time differences of the order of 10^{-10} sec.

4377 Blackbody Source Unit With Electronic Temperature Control. Raymond H. McFee. *Review of Scientific Instruments*, v. 23, Jan. 1952, p. 52-53.

Describes the above. By using a smaller thyratron (2021) with a relay in its plate circuit, a reliable "on-off" regulator is obtained.

4378 Compact Water Cooled Mount and Light Shield for 1000-Watt High Pressure Mercury Arc Lamp AH-6. Rodes Trautman, Orwin B. Westwick, and D. M. Graham. *Review of Scientific Instruments*, v. 23, Jan. 1952, p. 53-54.

Describes and illustrates the above.

4379 Ionization Gauge With Thoria-Coated Cathode. O. A. Weinreich and H. Bleecher. *Review of Scientific Instruments*, v. 23, Jan. 1952, p. 56.

Gives an account of construction and operating conditions of the above.

4380* Progress in Practical Microscopy. R. Barer. *Journal of the Royal Microscopical Society*, ser. 3, v. 71, Dec. 1951, p. 307-337.

Discusses above with respect to increased resolving power and new methods of obtaining contrast. 65 ref.

4381* Simplified Techniques for the Employment of Fluorescence Microscopy. J. King. *Journal of the Royal Microscopical Society*, ser. 3, v. 71, Dec. 1951, p. 338-341.

A method is described for using a compact-source, high-pressure mercury-vapor lamp for fluorescence microscopy in place of the conventional monochromator, with the aid of compound filters consisting of glass and liquid filters, giving bands of frequencies through a range of 2652 to 3655 A. A new range of fluorescent dyes known commercially as "optical bleaches" was used for fluorescent staining of fibers and plant sections.

4382* Logic Machines. Martin Gardner. *Scientific American*, v. 186, Mar. 1952, p. 68-73.

Presents a history of the development of the above. The application of logic networks in electronic computers is considered.

4383* Present State of Temperature Control in the Operation of Blast Furnace Hot Blast Stoves. (In German.) Erich Martin. *Stahl und Eisen*, v. 72, Feb. 14, 1952, p. 176-185.

Discusses methods used in the above and their limitations.

4384* The Grain Sizes of Ground Material. (In German.) H. Fricke. *Staub*, Mar. 15, 1951, p. 30-37.

Shows the importance of fineness and distribution of grain sizes in powdered-fuel combustion and in all kinds of chemical and physical reactions; also discusses Rosin-Rammler's exponential law and the correlation between summation and distribution curves. Tables and nomograms. 10 ref.

4385 Firing Temperatures Controlled. Michael Bozsin. *Steel*, v. 130, Feb. 25, 1952, p. 82-83.

Illustrates system in which electronic recording instruments, riding through furnaces in a specially designed box, give porcelain enamelers closer control of furnace temperatures during production.

4386* Recording and Evaluating. Methods, Instruments, and Application of Statistical Techniques of Measuring. (In German.) F. Ferrari. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 94, Feb. 1, 1952, p. 101-107.

Discusses modern methods and instruments of recording fixed and variable quantities. Photographs, diagrams, and graphs are presented.

4387* Determining the Optical Constants and Layer Thickness of Layers of Any Thickness With the Aid of the Absolute Phase. (In German.) Herwig Schopper. *Zeitschrift für Physik*, v. 131, no. 2, 1952, p. 215-224.

Description of mathematical procedure includes graphs and tables. 34 ref.

Miscellaneous Publications

4388 Electrical Pressure Integrator. Arleigh P. Helfer. National Advisory Committee for Aeronautics, Technical Note 2607, Jan. 1952, 44 pages. (TL570 Un3t)

The design of an instrument utilizing Wheatstone-bridge pressure-sensing units capable of integration of airfoil pressures into a quantity representative of normal force and pitching moment acting on an airfoil is presented. Tables, graphs, diagrams, and illustrations.

4389 A Description and a Comparison of Certain Nonlinear Curve-Fitting Techniques, With Applications to the Analysis of Transient-Response Data. Marvin Shinbrot. National Advisory Committee for Aeronautics, Technical Note 2622, Feb. 1952, 41 pages. (TL570 Un3t)

The methods described are evaluated by applying them to calculation of the stability parameters of an airplane from flight data. Other points considered: application of the methods to minimization problems other than curve fitting and the question of convergence to a mere stationary point as opposed to convergence to a minimum. Several devices which lead to more rapid convergence of the methods are discussed. 10 ref.

4390 Coincidence Method Applied to Ion Beam Measurement. Stanley Fultz and M. L. Pool. National Advisory Committee for Aeronautics, Technical Note 2627, Feb. 1952, 13 pages. (TL570 Un3t)

A coincidence Geiger-counter system was constructed for absolute measurement of the activity of radioactive substances made in a cyclotron. The average beam current in the cyclotron can be calculated from the number of disintigrations per second observed, the half-life of the radioactive substance, and the reaction cross section.

4391 Bath Pyrometry. W. T. Sergy. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 185-195. (TS1 Am350)

The primary types of bath pyrometers currently popular are: the blowing-tube radiation type, and the Pt-Pt+13% Rh thermocouple. Describes use of these instruments at the Pittsburgh works of Jones and Laughlin Steel Corp. and presents data accumulated since installation of the bath pyrometers.

4392 Recent Development in Open-Hearth Bath-Temperature Control. T. J. Hoby and R. J. McCurdy. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 196-202. (TS1 Am350)

Surveys the above. Records of heats of various steels are given.

4393 Steel-Plant Process Control. J. L. Scarry and D. A. Hayes. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 238-247. (TS1 Am350)

Discusses a realistic approach to the solution of the type of process-control problems that may arise in the steel industry and demonstrates the methods used. Graphs.

4394 A Nuclear Plate Camera for Fast Neutron Spectroscopy at the Bulk Shielding Facility. J. L. Meem and E. B. Johnson. U. S. Atomic Energy Commission, AECD-3266, Sept. 14, 1951, 14 pages. (UF767 Un3m)

Discusses and describes the principles of the above. Tables and illustrations.

Books

4395 The Non-Destructive Testing of Metals. R. F. Hanstock. 163 pages. 1951. Institute of Metals, London. (TA460 H19n)

Presents a restatement of certain sections of the sciences, mainly classical physics, having a particular bearing on the nondestructive examination of metals. Indicates the limitations within which a test may be expected to operate successfully.

4396 Nomographic Charts. C. Albert Kulmann. 244 pages. 1951. McGraw-Hill, New York. (QA90 K95n)

Presents 92 charts which provide a means of solving a variety of functional and general problems in the fields of hydraulics, mechanics, thermodynamics, and electrical engineering. Description of method of use, applications, and accuracy accompanies each chart.

See also:

3819 (openhearth control systems)
3911 (gaging of drawing-die holes)
3940 (high-precision-gaging symposium)
4000 (automatic control of heat-treating furnaces)
4461 (flame-temperature measurement)
4630 (electron-microscope study of fine structures)
4916 (temperature measurement in high-velocity air streams)
4959 (British automatic calculator)
5020 (counting machine for paper money)

17. METALS—FABRICATION AND USES

4397 Wider Uses Found for Textured Metals. *Automotive Industries*, v. 106, Mar. 1, 1952, p. 51.

Discusses applications for ferrous and nonferrous textured metals.

4398 Stainless Steels in Chemical Handling. *Canadian Chemical Processing*, v. 36, Feb. 1952, p. 64.

Experiences of specific plants are outlined.

4399 Metals, Ceramics, and Seals Used in Vacuum Tubes. Stanley Taylor. *Engineering Experiment Station News* (Ohio State University), v. 23, Dec. 1951, p. 52-55.

Briefly reviews the above. Presents some processes for metal-ceramic and mica-metal seals.

4400 Germanium Promises an Early Revolution in Electronics. *Engineering and Mining Journal*, v. 153, Feb. 1952, p. 154, 156, 159.

Discusses utilization of electrical properties of Ge. New Ge units are an amplifier or transistor and a rectifier. Gives advantages and a general survey of the metal and its properties.

4401* Aluminum: Where It's Used and Why In Modern Food Handling. Floyd A. Lewis. *Food Engineering*, v. 24, Feb. 1952, p. 77-80, 177-179.

An illustrated survey.

4402 Wanted: Better Materials for Nuclear Reactors. George E. Evans. *Iron Age*, v. 169, Mar. 13, 1952, p. 93-97.

Reactors resemble huge heat exchangers, and materials must have satisfactory physical and thermal properties. Ti, Zr, and Be offer possibilities as construction materials. Bi, Pb, Na, and K can be used as liquid metal coolants. Ceramics and ceramic-metallics offer unusual mechanical properties at high temperatures. Several new alloys are suggested.

4403 Applications of Light Metals. *Light Metals*, v. 15, Feb. 1952, p. 63-65.

Third and concluding section of a bibliography of articles on the applications of Al and Mg and their light alloys which have appeared in *Light Metals*, from June 1949 to Dec. 1951, inclusive.

4404* Magnesium Is Important In Sikorsky Helicopters. *Magazine of Magnesium*, Feb. 1952, p. 14-15.

Describes and illustrates miscellaneous applications.

4405 Alloys vs. Straight Carbon Steel for Mechanical Springs. *Mainspring*, v. 14, Feb. 1952, 4 pages.

Discusses conditions necessary to make pretempered wire, and the reasons why some alloy steels do not lend themselves to this process. Covers the patenting process and resulting mechanical properties.

4406 How to Choose Spring Materials. M. Gerard Fangemann. *Materials & Methods*, v. 35, Jan. 1952, p. 85-89.

Discusses types of springs, allowable stress and type of stress, vibrating frequency, and type of material applicable. Tabulated data. (To be continued.)

4407 Progress in Aluminum and Its Alloys: Current Applications and Future Prospects. P. L. Martyn. *Metallurgia*, v. 45, Feb. 1952, p. 65-69.

Attention is drawn to a number of interesting applications and future prospects are discussed in the light of the rearmament program and growing production capacity.

4408* Special Alloys and Electrical-Resistance Materials. (In French.) M. Fernier. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 863, 865-867, 869-871.

Discusses special thermal-expansion alloys, thermocouples, special alloys for electrical and magnetic applications, electrical resistors, and thermocouples. Pertinent physical properties are tabulated and charted.

4409* Triplex Steel for Plow Moldboards. (In French.) M. Dubois. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 879-880.

Discusses relative merits of ordinary openhearth steel and triplex steel for the above. Advantages of the latter are indicated. Various methods of surface finishing (hard-Cr plating, carburization, nitriding, and chromizing) are discussed.

4410* Magnets. (In French.) M. Allec. *Métallurgie et la Construction Mécanique*, v. 83, Nov. 1951, p. 881, 883, 885-887.

Surveys the various types of magnets, their design, composition, and magnetic properties. Graphs, table, and illustrations.

4411 Manufacture of Gas Turbine Blades; Their Properties, Forging, Heat-Treatment and Inspection. H. W. Kirkby. *Metal Treatment and Drop Forging*, Feb. 1952, p. 61-66.

Metal alloys suitable for both short life (airplane-engine) and long-life gas turbines are reviewed. The forging of blades, their heat-treatment, and testing are also described. Data are graphed and tabulated.

4412* High Resistance ALS Steel for Light Construction. (In French.) A. Bartocci. *L'Ossature Métallique*, v. 16, Dec. 1951, p. 594-598.

Describes composition and mechanical properties of new types of low alloy steels having excellent welding characteristics and a higher strength range—80-110 kg. per sq. mm.—than steels with low alloying-element composition. Includes tables and photographs.

4413* Some Recent Developments in Semihard Steels for Welded Construction. (In French.) C. Fornaci. *L'Ossature Métallique*, v. 16, Dec. 1951, p. 603-607.

Discusses 2 kinds of steel, one with a small content of Mn-Cr, the other with a small content of Mn-Cr-Cu, and their use in the production of high-pressure tubing. Includes micrographs, charts, and photographs.

4414 History and Progress of French Light-Alloy Railroad Cars. (In French.) *Revue de l'Aluminium*, v. 28, Dec. 1951, p. 447-450.

Illustrates various types of the above, built for various specialized freight-handling applications.

4415* Refractory-Lined Burner With Gas Supplied From the Top. (In German.) Johann Neumann. *Sprechsaal für Keramik; Glas; Email*, v. 85, Jan. 20, 1952, p. 25-26.

Burner described and illustrated was designed for a glass-melting furnace for firing with either gas or oil. It is shown that this burner can also be used on furnaces of the regenerator-type.

4416* Heat-Resistant Steels for the Glass Industry. (In German.) H. Kalpers. *Sprechsaal für Keramik; Glas; Email*, v. 85, Feb. 5, 1952, p. 53-54.

Discusses briefly composition and mechanical properties of 3 types of heat-resistant steels: carbon steels, Si steels, and Cr steels.

4417* Marine Developments in Aluminium. *Transactions of the Institution of Engineers & Shipbuilders in Scotland*, v. 95, pt. 2, 1951-1952, p. 49-63.

Extensive discussion by various individuals of paper by J. Venus, published in a previous issue. Includes author's reply.

4418* Aluminum as Material in the Dairy Plant. (In German.) David Stussi. *Werkstoffe und Korrosion*, v. 3, Jan. 1952, p. 5-11.

Shows that Al, especially the Al alloy "anticorrodal," is far superior to other materials for dairy equipment and containers. 22 ref.

4419* Cast Structural Material. (In German.) W. Hartmann. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 94, Jan. 21, 1952, p. 65-73.

Diagrams and photographs illustrate discussion of the advantages and disadvantages of cast iron and welded or forged steel for machine parts. Close cooperation of the designer with the foundryman is recommended. Data are graphed and tabulated.

See also:

3799 (uses of cobalt)
3905 (use of Ti in aircraft)
3909 (materials for nonferrous extrusions)
3917 (applications of Be-Cu wire)

3948 (tool and forming materials)
3956 (application of powder metallurgy)
4029 (application of steelite in hardfacing)
4131 (Cu alloys in the watch industry)
4161 (applications of Ti and alloys)
4186 (hard-facing materials)
4238 (steels used in chemical equipment)
4732 (metal+fluorcarbon polymer combinations)

18. POLLUTION AND WASTES

4420 How Dust Collectors Perform. Richard Dennis, G. A. Johnson, M. W. First, and Leslie Silverman. *Chemical Engineering*, v. 59, Feb. 1952, p. 196-198.

A field investigation of common types of commercial air cleaning equipment was undertaken by the Air Cleaning Laboratory of Harvard University for the purpose of expanding knowledge of collector performance. Discusses the results of tests on filter and inertial-type collectors.

4421 Stacks for Pollution Control. I. R. S. Steinbock. *Chemical Engineering*, v. 59, Feb. 1952, p. 202-203.

First of 3 articles on stack heights needed for effective control of atmospheric pollution. Stresses gaseous discharges smaller than 1 micron. (To be continued.)

4422 Industrial Electronic Fly-Ash Recorder. Marcel Grobtuch. *Electronics*, v. 25, Mar. 1952, p. 154, 156, 158, 162.

Describes an electronic fly-ash recorder to be used for examination of dust output from boilers. Diagrams.

4423* "Shock" Treatment Solves Smoke Problem. *Food Engineering*, v. 24, Feb. 1952, p. 92-94, 205-206.

Describes and illustrates how Anheuser-Busch cut fly-ash emitted in a 24-hr. day, at full load, to less than formerly expelled in 2 hr., by installation of electrostatic precipitation equipment. Research is being conducted to determine possible uses for the fly-ash collected.

4424* Metallurgical Fume and Flue Dusts. C. C. Downie. *Mining Magazine*, v. 86, Feb. 1952, p. 80-83.

Reviews the methods of handling fume and flue dust at large metallurgical works. Discusses the recovery of Se and Te.

4425* P.R.R. Builds Modern Plant to Treat Waste From Large Terminal. *Railway Engineering and Maintenance*, v. 48, Feb. 1952, p. 139-141.

Describes, diagrams, and illustrates above built by Pennsylvania R.R. for treating the effluent from its large engine and freight terminal at Enola, Pa. Sewage treatment was secondary to removal of oil and suspended solids.

4426* Stream Pollution. Rolf Eliassen. *Scientific American*, v. 186, Mar. 1952, p. 17-21.

Considers the characteristics of streams and their ability to absorb pollution. Methods of reducing stream pollution are discussed.

4427* Volatile Acid Production During Digestion of Several Industrial Wastes. A. Joel Kaplovsky. *Sewage and Industrial Wastes*, v. 24, Feb. 1952, p. 194-201.

Discusses experimental methods and results of the above study of yeast, paper white water, and slaughterhouse wastes.

4428* National Water Resources Policy as Related to Stream Pollution. L. R. Howson. *Sewage and Industrial Wastes*, v. 24, Feb. 1952, p. 222-227.

4429* Industrial Ejection of Dust. (In German.) Kurt Guthmann. *Staub*, Mar. 15, 1951, p. 11-29.

Discussion includes tabular data on composition, concentration, and source of atmospheric dust by location with respect to altitude, distance from source, and geography. 15 ref.

4430* Problems of Filtration of Very Fine Aerosols. (In German.) Fr. Bangert. *Staub*, June 15, 1951, p. 158-171.

Describes an accurate and rapid method of determining efficiency of microdust filtration and shows that an improved nephelometric method can be used to determine rapidly and continuously the efficiency of high-quality filters. Different types of filters are described and illustrated. Diagrams, tables, and photomicrographs are presented.

4431* Study of the Dust Content of Air Inside of and Outside of Manufacturing Establishments. (In German.) A. P. Avy. *Staub*, Sept. 15, 1951, p. 318-332.

Discussion of problems and of dust-measuring instruments indicates the suitability of Owens' Jet Dust Counter in which dust particles are precipitated by the condensation of water. Photomicrographs and photographs.

4432* The Technique of Conimetric Dust Counting. (In German.) W. Ehrhardt. *Staub*, Sept. 15, 1951, p. 333-341.

Describes and critically evaluates known methods of counting dust particles and discusses K. and M. Günther's conimetric method for determining dust content in air. Photographs, diagrams, and tables.

4433* Effect of Meteorological Conditions on Dust Dispersion in the Free Atmosphere. (In German.) M. Diem. *Staub*, Sept. 15, 1951, p. 342-355.

Reviews literature on effect of variations in wind velocity, temperature, precipitation, forests, and altitude on concentration of atmospheric dust and bacteria. Diagrams and graphs. 29 ref.

4434* Aerosol Properties and Factors Affecting Them. (In German.) H. Remy. *Staub*, Dec. 15, 1951, p. 429-442.

Combines review of literature with discussion of experimental and theoretical factors that affect behavior and properties of aerosols. Graphs, tables, and diagrams. 23 ref.

4435* Differential-Thermal Analysis and Its Application in Determination of Quartz Content of Dusts. (In German.) J. A. Schedling. *Staub*, Dec. 15, 1951, p. 449-454.

The analytical method described is based on fact that heating alters the physical and chemical properties of most substances. Includes diagrams and graphs.

Books

4436 Industrial Water Pollution; Survey of Legislation and Regulations. Marvin D. Weiss. 142 pages. 1951. Chemonomics, Inc., New York. (TD897 W43i)

The essential aspects of above legislation is reported. Emphasis is on effect of the laws upon industrial establishments within a state.

See also:
4040 (treatment of plating wastes)
4047 (recovery of chromic acid from plating operations)
4048 (plating waste problems)
4265 (industrial air analysis)
4305 (determination of cyanides in plating wastes)
4373 (natural radioactivity in aerosol studies)
4666 (physicochemical studies of dusts)
4840 (air pollution—injury to plants)

19. FUEL TECHNOLOGY

4437* Inflammability Limits of Ethane, Propane and n-Butane. (In French.) Ralph Delbourgo and Paul Laffitte. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Dec. 19, 1951, p. 1612-1614.

The above were investigated with respect to concentration, pressure, and appearance of the flames. Compares results with those of other investigators.

4438* Simplified Theory of the Height of Laminar Diffusion Flames. (In French.) Francis Guyomard. *Comptes Rendus hebdomadaires des Séances de l'Academie des Sciences*, v. 234, Jan. 2, 1952, p. 67-69.

Presents mathematical analyses of the above, for 3 cases.

4439* Structure of Shock and Combustion Waves. (In French.) Maurice Roy. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 7, 1952, p. 168-170; Jan. 14, 1952, p. 268-271.

The analysis of the structure of quasi shock waves in compressible fluids, presented in a previous paper, is extended to quasi shock waves of combustion.

4440* Propogation of an Explosion in a Tube Covered With a Film of Oil. (In French.) Roger Loison. *Comptes*

19. *Fuel Technology*

Rendus hebdomadaires des Séances de l'Académie des Sciences, v. 234, Jan. 28, 1952, p. 512-513.

Describes an explosion which is propagated at great speeds, by application of high pressures, in a tube containing no inflammable gaseous mixture, and covered only with a film of oil about 0.1 mm. thick.

4441* The Problem of the Three Limits of Ignition. (In Russian.) N. N. Semenov. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 645-648.

Conditions for establishment of limit-of-ignition boundaries of vapors and gases are analyzed theoretically.

4442* Oxidation of the Petrographic Components of Coal. (In Russian.) V. F. Oreshko. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 663-666.

Oxidation products at various stages of carbonization of several types of coal were determined. Data are discussed, tabulated, and charted.

4443* The Ignition of Powdered Coke. (In Russian.) Z. F. Chukhanov. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 11, 1951, p. 821-824.

Conditions for the above are described mathematically. A graphical solution for the final equation is given. Results are discussed.

4444* Dehydration and Concentration of Crude Peat and Crude Lignite. (In German.) Ernst Terres. *Brennstoff-Chemie*, v. 33, Jan. 23, 1952, p. 1-12.

Discusses briefly previous attempts of removing water from peat and describes a wholly novel method of concentrating above by forming a sludge, destroying the colloidal nature of peat particles, filtering the substance, and heating the filtrate. Experimental data and data on European peat and lignite deposits are graphed and tabulated.

4445* Water Gas From Coal Dust. (In German.) K. H. Osthaus. *Brennstoff-Wärme-Kraft*, v. 4, Jan. 1952, p. 6-10.

Discusses procedures to be observed in the generation of water gas from pulverized coal and describes the Koppers-Totzek process as an example. A diagram and graphs are presented.

4446* Calculation of Gasification Equilibria. (In German.) S. Traustel. *Brennstoff-Wärme-Kraft*, v. 4, Jan. 1952, p. 10-13.

Refers to gasification of solid fuels. Describes a relatively simple method for the above, including numerical examples.

4447* New Information on the Combustion Mechanism of Solid and Liquid Fuels. (In Germna.) S. Traustel. *Brennstoff-Wärme-Kraft*, v. 4, Jan. 1952, p. 17-20.

Discusses two recent articles by D. B. Spalding on the calculation of combustion rates. Includes graphs.

4448* Behavior of Sulfur and Nitrogen Compounds in Gasification and Its Mathematical Determination. (In German.) Wilhelm Gumz. *Brennstoff-Wärme-Kraft*, v. 4, Jan. 1952, p. 13-16.

Shows that combustible sulfur in generator and water gas occurs primarily as H_2S and a smaller part as organic sulfur—primarily as COS. Two simple methods of computing gas composition, including H_2S and COS, are described and it is pointed out that N compounds play an insignificant role. Data are tabulated. 23 ref.

4449* Contribution to the Study of the Coking of High-Volatile Coals of the Kuznetsk Basin. (In French.) I. V. Guebler. *Circulaire d'Informations Techniques*, v. 9, Jan. 1952, p. 59-70. (Translated from *Izvestiia Akademii Nauk SSSR*, Section of Technical Sciences, June 1948, p. 873-882.)

Describes above with respect to finely crushed coke, the optimum proportion of coke dust, and classification of the coke breeze used. Includes photographs, tables, and charts.

4450* Relationships Between Coking Conditions, Tar Yield, and Tar Composition. (In German.) P. Damm. *Erdöl und Kohle*, v. 4, Dec. 1951, p. 765-770.

Discusses effect of age of coal, coking temperature, and oven type on tar yield. Several suggestions are made for improving the results of coal distillation. Graphs, diagrams, and tables.

4451* Combustion and Gasification From the Chemical-Equilibrium and Kinetic Viewpoints. (In French.) M. Chateau. *Flamme et Thermique*, v. 3, Apr. 1950, p. 11-23.

Presents comprehensive discussion of various aspects of the above. Numerous graphs and tables. 15 ref.

4452* Experiences With U. S. Coal in Gas and Coke Preparation in the Kiel Gasworks. (In German.) Hans Siebel. *Gas- und Wasserfach*, v. 93, Jan. 1, 1952, p. 15-21.

Comparative data for various American and German coals are tabulated and discussed. Micrographs and macrographs illustrate coke structures obtained.

4453* Coke and Gas Yield of Gas Works, With Special Emphasis on Poorly Coking or Non-Coking Coals. (In German.) Fritz Schuster. *Gas- und Wasserfach*, v. 93, Feb. 1, 1952, p. 57-67.

Discusses proposed methods of increasing the elasticity of coke-gas yield ratios in order to conform to varying demands for gas and coke. Tables, graphs, diagrams, and photographs.

4454 Pre-Ignition Reactions of Some Combustible Substances With Solid Oxidants. Saul Patai and E. Hoffmann. *Journal of Applied Chemistry*, v. 2, Jan. 1952, p. 8-11.

Discusses and presents results of above investigation. Graphs and tabular data. 12 ref.

4455 Kinetics of OH Radicals From Flame Emission Spectra. IV. A Study of the Hydrogen-Oxygen Flame. H. P. Broida and K. E. Shuler. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 168-174.

The inner and outer cones of H_2-O_2 flames burning lean, stoichiometric, and rich mixtures at atmospheric pressure were studied spectroscopically. Rotational, vibrational, and electronic distribution of OH ($^2\Sigma^+$) was determined for both the inner and outer cone of each fuel mixture. 16 ref.

4456 Nonisotropic Propagation of Combustion Waves in Explosive Gas Mixtures and the Development of Cellular Flames. John Manton, Guenther von Elbe, and Bernard Lewis. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 153-157.

The phenomenon of nonisotropic propagation consists in spontaneous development of blisters or cells on the surface of a combustion wave. Experiments on spherical flames and on flames in wide tubes are reported.

4457 The Evaluation and Classification of Coals From Commonwealth Sources. W. Francis. *Journal of the Institute of Fuel*, v. 25, Jan. 1952, p. 15-28.

Discusses the composition and properties of a wide range of coals from British Commonwealth countries, with particular reference to their detailed examination by the following methods: ultimate and proximate analyses, Gray-King assay, rational analysis, petrology, physical methods, B.M.A.G.A. carbonization assay, and briquetting power without binder. 12 ref.

4458 Flame Radiation Research Joint Committee: Further Reports of 1949 Trials at Ijmuiden. 3.2.2. The Primary Analysis of the Trials. L. F. Daws and H. Herne. **3.2.3. Comparative Results With Optical Measurements.** G. Ribaud, M. Michaud, M. Riviere, and J. Galey. **3.2.4. Effects of the Main Variables on the Flame Emissivities.** L. F. Daws and M. W. Thring. **5.1. Conclusions Drawn From the 1949 Performance Trials at Ijmuiden.** J. E. de Graff and M. W. Thring. *Journal of the Institute of Fuel*, v. 25, Jan. 1952, p. S17-S36.

Continues detailed analysis and discussion of research conducted on flame radiation. Extensive tabular and graphical data.

4459* Scientific Utilization of Coal for Coking. *Journal of Scientific and Industrial Research*, v. 10A, Dec. 1951, p. 475-481.

Discusses the resources of good quality coking coals in India. Conservation measures are suggested.

4460* Bituminous Coal Research. A. C. Richardson, H. W. Nelson, and R. B. Engdahl. *Mining Congress Journal*, v. 38, Feb. 1952, p. 98-101.

Discusses research on the conversion of coal into fluid fuels, mining, preparation, carbonization, and direct utilization.

4461 Use of Radiation From Incandescent Particles as an Indication of Flame Temperature. Earle K. Plyler and Curtis

J. Humphreys. *Journal of Research of the National Bureau of Standards*, v. 47, Dec. 1951, p. 456-460.

Presents results of a preliminary investigation of the measurement of flame temperatures by using ultraviolet intensity measurements. Fuel-rich oxyacetylene flames were used because they contain the desired incandescent particles. Ratios of intensities in the chosen spectral regions were determined photographically and photoelectrically. Flame temperatures from 1900 to 2400°C. were determined.

4462 Production of Sulphur Trioxide During the Combustion of Carbon In Air Containing Small Quantities of Sulphur Dioxide. G. Whittingham. *Nature*, v. 169, Jan. 1952, p. 155-156.

It is known that oxidation of SO_2 occurs in the pre-flame and flame combustion of CO, hence this work was extended to the C-O system where, at temperatures above 650°C., CO combustion takes place in close proximity to a carbon surface.

4463 Accessible Surface Areas of Coals. G. Nagelschmidt and J. Cartwright. *Nature*, v. 169, Feb. 16, 1952, p. 269-271.

Separate communications by F. A. P. Maggs; I. G. C. Dryden; and G. Nogelschmidt and J. Cartwright. Conclusion reached shows that permanent pores exist in coal, that there is a wide distribution of pore sizes, and that adsorption of inert gases at liquid-air temperature indicates a much smaller surface area than adsorption and allied methods at room temperature. 21 ref.

4464 Role of Hydrogen Atoms in Flames; An Expansion Phenomenon. J. R. Arthur and R. F. Littlejohn. *Nature*, v. 169, Feb. 16, 1952, p. 288-289.

Describes experimental work on the above with emphasis on the dimensions of flames.

4465 The Excitation and Intensity Distribution of CH Bands in Flames. R. A. Durie. *Proceedings of the Physical Society*, v. 65, sec. A, Feb. 1, 1952, p. 125-128.

On the basis of the above work it appears that observations on the predissociation in CH, when organic substances are introduced into flames, may provide a simple method of determining if thermal equilibrium has been established.

4466 The Spectra of Flames Supported by Fluorine. R. A. Durie. *Proceedings of the Royal Society*, ser. A, v. 211, Feb. 7, 1952, p. 110-121.

The 1st part covers flames with organic substances. The spectra of several of these flames are described. Similarity of spectra of the hydrocarbon/fluorine and hydrocarbon/oxygen flames and possible mechanisms for carbon and C_2 and CH formation in these flames are discussed. The 2nd part covers flames with inorganic substances. Spectra of the fluorine-supported flames with H_2, S, H_2O, and NH_3, were studied. 30 ref.

Miscellaneous Publications

4467 Investigation of Hydrocarbon Ignition. Charles E. Frank and Angus U. Blackham. National Advisory Committee for Aeronautics, Technical Note 2549, Jan. 1952, 33 pages. (TL570 Un3t)

Accurate spontaneous ignition temperatures were determined for some 50 pure organic compounds. Effects of a wide variety of additives and of 8 selected metals on the spontaneous-ignition-temperature values of representatives of this group also were observed. Results are correlated with chemical structure and with antiknock characteristics where known; more fundamental aspects of the possible chain-breaking and chain-branching reactions involved are also considered. Data are graphed and tabulated. 23 ref.

4468 Flame Speeds of Methane-Air, Propane-Air, and Ethylene-Air Mixtures at Low Initial Temperatures. Gordon L. Dugger and Sheldon Heimel. National Advisory Committee for Aeronautics, Technical Note 2624, Feb. 1952, 25 pages. (TL570 Un3t)

Presents results of investigation of the above. Relative values of flame speed could be predicted within approximately 20% by either a thermal or a diffusion theory of flame propagation. Linear correlations existed between maximum flame speed and calculated equilibrium active-radical concentrations. Data are graphed. 16 ref.

4469 Charcoal Production and Uses. Northeastern Wood Utilization Council, (New Haven, Conn.), Bulletin 37, Jan. 1952, 101 pages. (TA419 N81b)

The following papers with discussions are presented: "The Physical and Chemical Properties of Commercial Charcoals in Relation to Industrial Use," C. A. Stokes and Hanna Friedenstein; "Small Rectangular Charcoal Kilns," Henry W. Hicock; "Charcoal Production in Steel Drums," Henry I. Baldwin; "The Continuous Carbonization of Wood; SIFIC Process," August Lambiotte; "History and Present Status of the Industry; Continuous Carbonization, the Mellman Retort," Donald F. Othmer; "Beehive Kiln Operation," Donald F. Othmer; "Domestic Uses and Distribution," Charles K. Richardson; "Industrial Uses," S. P. Kelly; "Briqueting of Charcoal," Robert S. Aries; and "Active Carbon," John W. Hassler. All papers include discussions.

4470 Flammability of Mixtures of Individual Paraffin-Hydrocarbon Gases With Air and Added Nitrogen at Subatmospheric Pressures. G. S. Scott, M. G. Zabetakis, and A. L. Furno. U. S. Bureau of Mines, Report of Investigations 4839, Jan. 1952, 12 pages. (TN21 Un3r)

The gases tested include natural gas, methane, ethane, propane, normal butane, and isobutane. The minimum pressures at which these gases are capable of propagating flame when individually mixed with air were also investigated. 30 ref.

Book

4471 Gengas: Svenska Erfarenheter fran Aren 1939-1945. (Generator Gas: Swedish Experiences in the Years 1939-1945.) 358 pages. 1950. Generalstabens Lithografiska Anstalts Forlag, Stockholm, Sweden. (TP343 G28)

Comprehensive treatise on the production of generator gas and its uses—especially as fuel for internal-combustion engines. Includes numerous photographs, diagrams, graphs, tables, and a list of definitions. 63 ref.

See also:

4244 (determining O_2 in coals)
4384 (pulverized-fuel combustion)
4607 (coals as a fuel-survey)
4610 (briquetting of Indian coals)
4622 (coal and oil processing)
4867 (size distribution in coal)
5006 (coal economics)
5011 (lignite technology and prospects)

20. HEATING, DRYING, AND AIR CONDITIONING

4472* Applications of the Heat Pump. N. C. Ebaugh. *Journal American Water Works Association*, v. 44, Feb. 1952, p. 131-140; disc., p. 140-141.

Presents a brief historical background of the heat pump, some of its present applications for air conditioning and industrial purposes, and possible effects the heat pump may have upon water supply.

4473* Computing Waste-Gas Loss in Gas-Fired Installations by Means of Siegert's Formula. (In German.) Rudolf Frey. *Brennstoff-Wärme-Kraft*, v. 4, Jan. 1952, p. 20-21.

Description of above includes discussion of effects of temperature and of atmospheric air, limits of accuracy, and approximation methods. Data are tabulated.

4474* Measuring the Tube-Wall Temperatures of Superheaters. (In German.) G. Schiemann. *Brennstoff-Wärme-Kraft*, v. 4, Feb. 1952, p. 37-44.

To investigate the causes that reduce the life of coils of steam generators, experiments were made to study the temperature behavior of the tube walls. Methods of measuring the temperature are described and illustrated and ways of avoiding excessive temperatures are indicated. Includes tabulated data and graphs.

4475* Oxygen in Industrial Heating and Gasification. Part I. *Coke and Gas*, Feb. 1952, p. 55-60.

Some of the more important aspects of the present position are discussed along with the technical characteristics of the use of oxygen-enriched air. (To be continued.)

20. *Heating, Drying, and Air Conditioning*

4476* Efficient Multiple-Fuel Firing. William H. Pugsley. *Factory Management and Maintenance*, v. 110, Feb. 1952, p. 129.

Discusses the above. Curves show percent of O_2 and CO_2 in flue gases of common industrial fuels in relation to percent excess air.

4477* Reheat and the Application of Steam Generators to the Reheat Cycle. A. R. Weismantle. *Heat Engineering*, v. 27, Feb. 1952, p. 21-31.

Discusses basic considerations of the reheat cycle. Considers steam-generator design and its applications.

4478 Tests Air Panel Heating, Cooling for Floor or Ceiling Use. R. P. Goemann. *Heating, Piping & Air Conditioning*, v. 24, Mar. 1952, p. 98-99.

Two methods of construction are described for heating or cooling by means of air circulated within either floors or ceilings—the air being subsequently discharged into the room. Results of a test installation are given briefly. The basic material used is a cellular steel panel which is widely employed as a structural subfloor. The panels are welded to the steel frame of the building and topped with a 2½ in. poured concrete floor.

4479 Thermal Performance of Frame Walls. G. O. Handegord and N. B. Hutcheon. *Heating, Piping & Air Conditioning*, v. 24, Mar. 1952, p. 113-118.

A study of the effects of convection in insulated and uninsulated walls containing air spaces. Data are presented which illustrate the vertical variation in temperatures and heat flow rates existing in frame walls, when the insulation is ideally applied, and when openings occur at the top and bottom of insulations installed to form two air spaces.

4480 The ASHVE Environment Laboratory. Cyril Tasker, C. M. Humphreys, G. V. Parmelee, and L. F. Schutrum. *Heating, Piping & Air Conditioning*, v. 24, Mar. 1952, p. 119-128.

Discusses research program in panel heating and cooling.

4481 Drying and Finishing Ovens. Parts I and II. J. D. Russell. *Industrial Heating*, v. 19, Jan. 1952, p. 107-108, 110, 112, 114, 116, 118, 121; Feb. 1952, p. 297-298, 300, 302, 304, 306.

Principles and practices involved in various types of oven design and the application and influence of air heaters for industrial drying and finishing are described and illustrated. Continuous conveyor-type ovens, including horizontal continuous and vertical conveyor ovens are discussed, as well as the importance of air recirculating systems and the scope of oven applications. (To be continued.)

4482* The Drying of Pastes, Powders and Crystals. L. Clegg and S. V. Jackson. *Journal of the Institute of Fuel*, v. 25, Jan. 1952, p. 3-13.

Classifies types of driers used for the above under contact and convection driers. Technical considerations in connection with driers falling under these headings are discussed and the physical characteristics of pastes, powders and crystals are examined in relation to the drying process. Results of actual tests—giving operating data, fuel consumption, and thermal efficiencies—are reported. General conclusions are drawn from preliminary investigations into drying in certain industries. 12 ref.

See also:
4469 (furnaces for charcoal firing)

21. PRIME MOVERS

4483* The Rate of Climb of Turbo-Jet Aircraft. D. C. Whittley. *Aircraft Engineering*, v. 24, Feb. 1952, p. 45-47.

Presents a method of analyzing test data to establish the climb performance of above aircraft.

4484 The Combustion Gas Turbine—A New Tool for the Power Engineer. Part II. W. B. Wilson. *Blast Furnace and Steel Plant*, v. 40, Feb. 1952, p. 226-227.

Discusses the advantages of the combustion gas turbine in the steel industry. Compares gas-turbine and steam-turbine plants.

4485 A Souped-Up Powerplant for Industry. *Business Week*, Mar. 8, 1952, p. 134, 136-137.

Discusses the gas turbine as an economical power plant.

4486 Thermal Performance of Modern Turbines. H. R. Reese and J. R. Carlson. *Combustion*, v. 23, Feb. 1952, p. 48-51.

Data are presented on heat rates to be expected for units of 75,000-200,000 kw. capacity operating on the regenerative cycle with various steam conditions from 850 psig., 900°F. to 2400 psig., 1100°F. and various stages of feedwater heating; also with the combined regenerative and re-superheating cycles. Graphs.

4487* The Marine Gas Turbine From the Viewpoint of an Aeronautical Engineer. A. Holmes Fletcher. *Engineer*, v. 193, Feb. 1, 1952, p. 187-189. (A condensation.)

Reviews the more obvious design characteristics of various typical aircraft turbines developing either jet or propeller thrust; and presents a scheme for a marine turbine, to take advantage of aircraft developments and other features.

4488 Nuclear Fuel for Power Production. J. F. Flagg, and M. J. Gross. *General Electric Review*, v. 55, Mar. 1952, p. 8-13.

Reviews nuclear fuel as to its requirements in supporting a chain reaction in a reactor at relatively high temperature and energy levels, and the problems involved in designing the reactor. Includes a brief discussion of the economics of nuclear power production.

4489 Design of Manifolds and Pipe Burners. Parts I and II. J. D. Keller. *Industrial Heating*, v. 19, Jan. 1952, p. 52, 54, 56, 58, 140; Feb. 1952, p. 218-220, 222, 224.

Discusses the theory and principles involved in manifolds for engines, gas burners, etc.; and presents results derived from theory and checked by practice. In Part II, manifolds of variable cross-sectional area are discussed. Factors to be considered include friction, relative length, and coefficient of friction. (To be continued.)

4490* Influence of Carbon Disulphide on Octane Number and Lead Susceptibility. Geo. E. Mapstone and J. S. Durham. *Journal of the Institute of Petroleum*, v. 37, Dec. 1951, p. 737-739.

Presents results of determination of the above using a 60/40 blend of iso-octane and n-heptane as a reference fuel. CS_2 composition varied from zero to 1.0% by weight.

4491 Steady-State One-Dimensional Flow in Rocket Motors. E. W. Price. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 142-149.

Solutions are presented for the problem of gas flow in a solid propellant rocket motor using combined numerical and graphical methods. Solutions cover the entire range of nozzle, charge-size combinations, including the case of no nozzle, for a specific propellant.

4492 Piston Act Parallel to Power Shaft in Internal Combustion Engine. *Product Engineering*, v. 23, Mar. 1952, p. 146-147.

Describes reciprocating-type aircraft engine developed by the Herrmann Engineering Co., Glendale, Calif.

4493* The Resonator as a Possibility of Reducing Fuel Consumption in Airplane Turbine Engines. (In German.) F. H. Reynst. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 94, Jan. 21, 1952, p. 79-84.

Two possibilities of reducing the fuel consumption were investigated: namely, improving the propulsion or thermal efficiency. Replacing constant-pressure combustion chambers by resonators is shown to increase the thermal efficiency. Includes diagrams and graphs.

Miscellaneous Publications

4494 Evaluation of Three Methods for Determining Dynamic Characteristics of a Turbojet Engine. Gene J. Delio. National Advisory Committee for Aeronautics, Technical Note 2634, Feb. 1952, 56 pages. (TL570 Un3t)

Results of evaluation indicate that transient analysis gives basic dynamic characteristics with minimum running time and computation; Fourier analysis provides engine frequency spectra beneficial in control synthesis, but sensitive to instrumentation

and approximation errors; provides the additional high-frequency characteristics of the engine at the expense of longer running time and a moderate amount of computation. 12 ref.

Book

4495 Bau und Berechnung der Verbrennungskraftmaschinen. (Design and Calculations for Internal Combustion Engines.) Ed. 3. Otto Kraemer. 198 pages. 1948. Springer-Verlag, Berlin, Germany. (TJ255 K85b2)

Treatise on principles of internal combustion, suitable internal-combustion fuels, and designs of numerous types of internal-combustion engines. Includes graphs, tabular data, and drawings showing different engines and engine parts.

See also:
4930 (helicopter analysis—book)
4942 (guided missiles—circuit stability)
5013 (1952 power-plant survey)
5019 (jet-plane program of U.S. military)
5032 (aviation dictionary)

22. CERAMICS

4496* The Crystal Structure of Tricalcium Silicate. (In English.) J. W. Jeffery. *Acta Crystallographica*, v. 5, Jan. 1952, p. 26-35.

Three polymorphic forms of tricalcium silicate, the most important constituent of Portland cement clinker, were studied. All three are strongly pseudo-rhombohedral. Some preliminary deductions are made about the position of the Al and Mg atoms in the unit cell and also about the type of distortion of the pseudo-structure which would account for the diffraction effects. 17 ref.

4497* Ceramic Coatings. *Aircraft Production*, v. 14, Mar. 1952, p. 107-108.

Describes a ceramic coating "A-417" developed by National Bureau of Standards in the U.S. This coating is composed of a high-barium, alkali-free frit (glass) with a 30% admixture of chromic-oxide. Applications are given. Data are tabulated.

4498* Acceleration of the Hardening of Slag Cements. (In Russian.) P. P. Budnikov, V. N. Iung, and Iu. M. Butt. *Doklady Akademii Nauk SSSR*, new ser., v. 74, Aug. 11, 1951, p. 851-854.

The influence of relatively small amounts of $Ca(OH)_2$ or $Mg(OH)_2$ for promoting hardening of slag cements was investigated. Experimental data are discussed and tabulated.

4499* Anomalous Range of Glass. (In Russian.) I. V. Borovikov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 11, 1951, p. 229-232.

The transition of various glasses from the viscous to the brittle state was investigated. Data are discussed and charted.

4500* The Role of the Structure of Concrete in the Diffusion Process of Lime Leaching. (In Russian.) V. V. Stol'nikov and M. I. Furman. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 11, 1951, p. 783-786.

The leaching of lime from concrete was studied experimentally. Data are discussed, tabulated, and charted.

4501* The Influence of Steam Pressure on the Physico-Mechanical Properties of Silicate Bricks With Additions of Granular Sodium Silicate. (In Russian.) P. P. Budnikov, M. A. Matneev, and S. I. Iurchik. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 11, 1951, p. 255-258.

The above was studied with steam pressures up to 15 atm. and with up to 5% additions of sodium silicate. Data are discussed, tabulated, and charted.

4502* The Sedimentation Process in Concrete Mixes—Its Influence on Formation of Concrete Structures and on Its Water-Tightness. (In Russian.) V. V. Stal'nikov, P. A. Rebinder, and E. V. Lavrinovich. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 21, 1951, p. 431-434.

Describes experimental procedure for study of the above. Results are charted and discussed.

4503* Investigation of Dense Zirconium Glazes Using the Electron Microscope. (In Russian.) V. S. Fadeeve and M. E. Iakovleva. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 667-669.

Surfaces of the above were investigated. Findings are discussed and illustrated.

4504 Fundamental Study of Phosphate Bonding in Refractories. IV. Mortars Bonded With Monoaluminum and Monomagnesium Phosphate. William David Kingery. *Journal of American Ceramic Society*, v. 35, Mar. 1, 1952, p. 61-63.

Five compositions developed were tested for workability, water retention, strength, shrinkage, and appearance in mortar joints at temperatures up to 1500°C. Results obtained indicate that these mortars are equivalent to, or superior to, commercial mortars.

4505 Significant Aspects of Certain Ternary Compounds and Solid Solutions. F. A. Hummel. *Journal of American Ceramic Society*, v. 35, Mar. 1, 1952, p. 64-66.

Discovery of thermal contraction of β-eucryptite has introduced some new problems regarding the basic assumptions upon which previous thermal-expansion theory was based. These problems are presented together with a discussion of the chemical control of the thermal expansion of β-eucryptite-β-spodumene solid solutions. The relationship of the solid solutions to physical control of the thermal expansion of ceramic mixtures is presented.

4506 Density Changes in Thermometer Glasses. Laurence C. Liberatore and Helen J. Whitcomb. *Journal of American Ceramic Society*, v. 35, Mar. 1, 1952, p. 67-72.

Gives details of a study of the above. Thermometers fabricated from several glasses were given similar heat-treatments in their respective annealing ranges. Measurements were then made of the ice-point changes at various fixed temperatures from room temperature to the normal upper useful limits of the glasses.

4507 On the Role of Nickel in Porcelain Enameling. J. H. Keeler, P. K. Chu, and H. M. Davis. *Journal of American Ceramic Society*, v. 35, Mar. 1, 1952, p. 72-75.

Nickel applied to sheet steel as a Ni flash endures in the surface through several de-enamelings and re-enamelings. The attendant improvement in the enameling behavior of the steel is similarly persistent. Heat-treating experiments with and without Ni lead to the conclusion that, while the fired assembly is cooling, nickel oxide at the interface is reduced by H_2 from the steel, forming water which enters the enamel and diminishes the hydrogen available for defect production. 17 ref.

4508 Observations on the Nature of Cracks in Porcelain Enamel. Henry N. Staats. *American Ceramic Society Bulletin*, Feb. 1952, p. 33-38.

Discusses use of the electrified-particle inspection method in locating cracks in glass and porcelain enamel too narrow to reflect light and thus be seen by the aided eye. Includes theory of the method's operation as applied to various types of cracks, relationship between cracks, and performance.

4508a New Minerals for Ceramics and Conservation of Our Mineral Resources. Hewitt Wilson. *American Ceramic Society Bulletin*, Feb. 1952, p. 39-42.

4509* Use of Chicago Fly Ash in Reducing Cement-Aggregate Reaction. C. H. Scholer and G. M. Smith. *Journal of the American Concrete Institute*, v. 23, Feb. 1952; ACI Proceedings, v. 48, 1951, p. 457-464.

Discusses and presents results of experimentation of the above. Use of fly-ash produces concretes similar in nature to concretes with ordinary portland cement, with fly-ash concretes showing an increase in workability and improved finishing characteristics.

4510* Thermal Expansion of Aggregates and Concrete Durability. Edwin J. Callan. *Journal of the American Concrete Institute*, v. 23, Feb. 1952; *ACI Proceedings*, v. 48, 1952, p. 485-503.

Describes methods developed to obtain the thermal coefficients for numerous aggregates. Concretes were tested in accelerated freezing and thawing, yielding durability factors for each combination. These factors were statistically analyzed. Stresses set up by such differential expansion and their effects on concrete durability are discussed briefly.

22. *Ceramics*

4511* Air Heating Methods and Equipment. Parts I-IV. C. Crook. *British Clayworker*, v. 60, Nov. 15, 1951, p. 203-204; Dec. 15, 1951, p. 245-247; Jan. 15, 1952, p. 285-288; Feb. 15, 1952, p. 300-301.

Discusses the above in reference to the heavy clay industry.

4512* Silica Versus Basic Bricks. T. R. Lynam. *British Steelmaker*, v. 18, Feb. 1952, p. 79, 81.

Discusses relative merits of silica and basic products in the basic openhearth furnace.

4513 How to Lengthen Refractory Life. A. H. Thomson. *Canadian Metals*, v. 15, Feb. 1952, p. 24-25.

Discusses refractories for basic electric steel furnaces used in the foundry; and tells how to get best results from present day materials. Lists 11 variables in furnace operation affecting lining life.

4514 Flux V-26—A German Raw Material for Porcelain Enamels. Paul A. Huppert. *Ceramic Age*, v. 59, Feb. 1952, p. 18-19.

The above is a sodium-titanium-silicate in vitreous condition corresponding approximately to the formula Na_2O-SiO_2-TiO_2. Enamels produced with it possess good resistance to devitrification, in addition to increased resistance to chemical action, and high gloss and good surface hardness.

4515 Rotary Kiln Production of Light-Weight Clay Aggregates. Paul E. Cox. *Ceramic Age*, v. 59, Feb. 1952, p. 22, 24.

Surveys the above and presents various recommendations.

4516 The Glass Industry—1951. Part 1. High Output, Expansions Mark Big Year. Part 2. New Products Border on the Fantastic. H. E. Simpson. *Ceramic Industry*, v. 58, Feb. 1952, p. 70-72; Mar. 1952, p. 77-78.

4517 How to Develop Cordierite in a Gas Heater's Backwall Radiant. W. W. Gaskins. *Ceramic Industry*, v. 58, Mar. 1952, p. 85.

States that careful selection of raw materials and firing to just below vitrification are vital points in developing cordierite in shock-resistant bodies for above application. Recommended compositions are described.

4518* Silicon Carbide—Its Preparation, Properties and Uses in the Ceramic Industries. W. L. German. *Ceramics*, v. 3, Jan. 1952, p. 554-561.

4519* Classification of Refractories. W. P. Howells. *Ceramics*, v. 3, Jan. 1952, p. 570-578.

Discusses the above in detail, presenting the various ways for classification.

4520 Sulphur Cements. Raymond B. Seymour and Robert H. Steiner. *Chemical Engineering*, v. 59, Feb. 1952, p. 288, 290, 292, 294-296, 298-300, 302-304.

Presents corrosion-resistance data in graphical form for 180 different corrosives, on plasticized silica-filled sulfur cements used for joining bricks, tile, and cast iron pipe.

4521 Fireproof Fibers. *Chemical Week*, v. 70, Mar. 1, 1952, p. 32, 34.

Describes a new fiber which is chemically identical to quartz. Its role as an insulator is discussed.

4522 Some Applications of Colloid Science in Ceramics. D. A. Holdridge. *Chemistry & Industry*, Feb. 2, 1952, p. 94-97.

Discusses the aspects of ceramic practice which illustrate the significance of the colloidal properties of clay. 32 ref.

4523* Clay Engineering Bricks. Gamal M. Gad. *Claycraft*, v. 25, Feb. 1952, p. 258-261.

Deals with the selection of raw materials and firing of bricks under oxidizing conditions, to obtain the required properties. Photomicrographs and tabular data.

4524 Ceramic Materials in Corrosive Service. R. McFarland. *Corrosion* (News Section), v. 8, Mar. 1952, p. 1.

Discusses ceramics, their properties, and applications, with special reference to corrosion resistance to commercial chemicals.

4525* Experiments on the Vibration of Freshly Placed Concrete. R. H. H. Kirkham and A. C. Whiffin. *Engineer*, v. 193, Feb. 15, 1952, p. 240-243.

Beams for vibrating concrete slabs were largely developed empirically. Particulars are here given of a machine designed by the Road Research Laboratory to study the effects of the variables involved. Results of tests with this machine upon the effects of amplitude of vibration, number of vibrations in a given length, acceleration of the beam, and work done by the compacting machine are detailed. Conclusions are listed and practical implications discussed.

4526 Glass Tube Technology. 1. Glass-to-Metal Seals. Peter Whibley. *Engineering Experiment Station News* (Ohio State University), v. 23, Dec. 1951, p. 48-51, 55-56.

Presents data on metal and glasses suitable for sealing. Stresses resulting from differential contraction between glass and metal are discussed.

4527 Electric Conductance in Liquid Silicates. J. O'M. Bockris, J. A. Kitchener, S. Ignatowicz, and J. W. Tomlinson. *Transactions of the Faraday Society*, v. 48, Jan. 1952, p. 75-91.

The above was examined for the following metal oxides: Li_2O, Na_2O, K_2O, MgO, CaO, SrO, BaO, MnO, Al_2O_3, TiO_2; parts of the systems $MnO+CaO+SiO_2$ and $MnO+MnS+SiO_2$ were also examined. Where practicable, studies were made up to 1800°C. A feature of the theoretical treatment is the parallelism manifested between recent theoretical views on the importance of coulombic effects in the structure of solid glasses and application of these effects in the explanation of electric conductance as a function of the structure of liquid silicates. Phase diagrams. 24 ref.

4528* Glass in Conjunction With Synthetic Resins. Joseph B. Singer. *Glass*, v. 29, Feb. 1952, p. 49-54.

Discusses light-diffusing laminates, resin-bonded glass fibers, properties of low-pressure glass-cloth laminates, applications, and future possibilities.

4529* Story of the Development of the New Heat-Absorbing Glasses. R. A. Miller. *Glass Digest*, v. 31, Feb. 1952, p. 30, 32-34.

4530 The Annealing of Flat Glass. Boris Daragan. *Glass Industry*, v. 33, Feb. 1952, p. 69-74, 98. (Translated from *Verres et Refractaires*, June 1951.)

Previously abstracted from original.

4531 Long Time Load Tests on Commercial Types of Fire-Clay Brick. J. A. Crookston and D. R. Torgeson. *Industrial Heating*, v. 19, Feb. 1952, p. 326, 328.

In the investigation described, the ASTM load test was modified as follows: temperature-holding periods were run from 24 to 500 hrs., continuous deformation charts were obtained, and the testing temperature was varied.

4532* Stability of the Calcium Ferrites, Silicates and Aluminates in Aqueous Media: The Inactive Lime Content of Dolomitic Lime. F. C. Gilbert and W. C. Gilpin. *Journal of Applied Chemistry*, v. 1, Suppl. Issue 2, 1951, p. S109-S119.

The hydrolysis of the calcium silicates, ferrites, and aluminates which occur in calcined Durham dolomites was studied in various aqueous media, including partially spent sea-water, sugar solution, and buffered NH_4Cl solution. Using the latter medium, a comparatively simple test was developed for determining that part of the combined, or inactive, lime content of calcined dolomite caused by these compounds. The results obtained are discussed. Data are tabulated.

4533* The Bulk Density of Kaolin. S. J. Gregg and A. Behrens. *Journal of Applied Chemistry*, v. 1, Suppl. Issue 2, 1951, p. S139-S141.

The above was determined in vacuum and also in the presence of various amounts of adsorbed water vapor. When the amount adsorbed is approximately that required to fill a monomolecular layer on the surface of the kaolin particles, the bulk volume is higher by some 15% than it is in vacuo; it then varies only

slightly as water content increases up to 1.3% corresponding to about 15 molecular layers.

4534 Identification of the Cementing Material in a Light-Weight Sand-Lime Block. H. F. W. Taylor. *Journal of Applied Chemistry*, v. 2, Jan. 1952, p. 3-5.

Presents results of analytical and X-ray investigations for the above. The cementing material of a commercial light-weight sand-lime block was shown to be calcium silicate hydrate. The results may have bearing on the problem of hydration products of Portland cement.

4535 The Thermal Dependence of the Elastic Moduli of Polycrystalline Graphite. F. E. Faris, L. Green, Jr., and C. A. Smith. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 89-95.

Young's modulus and shear modulus of grade SA-25 molded graphite and grade AUF extruded graphite were measured as functions of temperature between 25 and 2000°C. Variations of the two moduli with position and direction relative to the axis of extrusion were also investigated.

4536 Adsorption Studies on Clay Minerals. I. Chromatography on Clays. Joseph A. Faucher, Jr., Raymond W. Southworth, and Henry C. Thomas. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 157-160.

With the aid of chromatographic columns containing a clay mineral dispersed on asbestos, ion-exchange processes on this mineral were studied. Results show that the columns do not run under equilibrium conditions. These exchanges make possible a correction procedure which serves to produce isotherms for cases of true ion-exchange. Details of the correction procedure are given together with some results for Cs-Na exchange on a specific montmorillonite.

4537* The Polymorphism of $MgSiO_3$ and Solid-State Equilibria in the System $MgSiO_3$-$CaMgSi_2O_6$. Leon Atlas. *Journal of Geology*, v. 60, Mar. 1952, p. 125-147.

The investigation is divided into 2 parts: the 1st is concerned primarily with stability relations among the various crystalline phases of $MgSiO_3$. The 2nd part is concerned with subsolidus phase equilibria in the system $MgSiO_3$-$CaMgSiO_3$.

4538 Properties of Some Bottom Ramming Materials. M. P. Fedock. *Journal of Metals*, v. 4, Mar. 1952, p. 247-249.

Includes test data on 6 of the more popular bottom ramming materials selected to emphasize the wide variation in properties of the different materials. Illustrated.

4539* The Importance of Refractory Coatings. *Machinery Lloyd* (Overseas Ed.), v. 24, Feb. 16, 1952, p. 87-92.

4540* Calculation of the Composition of Refractory Mixes. (In Italian.) F. Savioli. *Metallurgia Italiana*, v. 44, Jan. 1952, p. 14-16.

Examines the problem of calculation of the proportion of binding agents and lean material in above mixes. Includes nomograms and typical examples.

4541 Properties of Powdered $BaTiO_3$. V. E. Derr and M. D. Earle. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 384-385.

Presents data on discharge characteristics of capacitor with powdered $BaTiO_3$ as dielectric.

4542* Conductivity Study of Aqueous Kaolin NaCl Mixtures. Joseph W. Berg, Jr. *Producers Monthly*, v. 16, Jan. 1952, p. 36-41.

Experiments were carried out in which the true resistivities of aqueous kaolin-NaCl mixtures were measured in an effort to determine whether the effective conductivity of the clay in the mixture could be considered constant, independent of the salinity of the electrolyte. Effective clay conductivity was found to be dependent on salinity. An empirical equation was found which closely approximated the experimental data.

4543* Refractory Magnesite Products. (In German.) Friedrich Reinhart. *Sprechsaal für Keramik; Glas; Email*, v. 85, Jan. 20, 1952, p. 27-28.

Discusses briefly various improved methods of producing the above.

4544* The Nature of Sulfate Corrosion. (In German.) Rudolf Rasch. *Sprachsaal für Keramik; Glas; Email*, v. 85, Jan. 20, 1952, p. 28-29.

In discussing the above, it is shown that corrosion of glass-tank refractories does not occur at places of highest temperature. Illustrations and charted data.

4545* The Light-Dark Process of Detecting Stresses in Colorless and Tinted Glasses With an Apparatus With Large Field of Vision. (In German.) E. Roeper. *Sprechsaal für Keramik; Glas; Email*, v. 85, Feb. 5, 1952, p. 50-52.

Discusses methods of determining quantitative determination of stresses and shows that distribution of stresses can be determined only with a large-field-of-vision microscope. Diagrams, tables, and photographs.

4546* Vitreous Enamelling Cast Iron and Steel. J. W. G. Pedder. *Times Review of Industry*, v. 6, Feb. 1952, p. 22-24.

Discusses the above. Presents data on typical formulas of enamelling frits for different processes.

4547* Acid-Resistant Cements. (In German.) Karl Dietz. *Werkstoffe und Korrosion*, v. 2, Dec. 1951, p. 446-448.

A new potassium silicate cement "Hoechst HFR" is described. It is said to have very high adhesive strength, chemical inertia towards Cr-Ni steels and Pb, high corrosion resistance to fluorine compounds in ceramic linings, ease of application, and resistance to strong hot acids (except HF.)

Miscellaneous Publications

4548 Quality of Silica Brick. W. S. Debenham and G. R. Eusner. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 129-138; disc., p. 139-141. (TS1 Am350)

Describes results of an investigation on the above. Tests were conducted with controlled atmospheres and temperatures.

4549 Combination Basic and Silica Brick in Open-Hearth Roof Construction. C. G. Poth. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 142-150; disc., p. 150-156. (TS1 Am350)

Discusses results of combinations of alternate courses of silica and basic brick as obtained at the Massillon plant of Republic Steel Corp. Illustrations.

4550 Open-Hearth Bottoms. H. M. Kraner and G. H. Anthony. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 157-161. (TS1 Am350)

Presents an appraisal of magnesite, slag, and Cr-bearing brick in the above.

4550a Linings for Hot-Metal Mixers. K. D. Bartels. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 178-183. (TS1 Am350)

Presents results of an investigation on the above. Included in the program were blast-furnace brick fired to cone 18, high-fired Missouri superduty fireclay brick, both dry-pressed and stiff mud, Missouri superduty fireclay brick fired to cone 23, chrome-magnesite brick burned and unburned, sillimanite brick, and 70% alumina brick. Illustrations.

4551 Refractories and Their Performanc in Cold-Metal Shops. Paul B. Akin. *Proceedings, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 34, 1951, p. 261-262; disc., p. 262. (TS1 Am350)

Describes experiences of the Laclede Steel Co., Alton, Ill. Basic brick was used to increase furnace life as follows: basic-brick end seals on silica furnaces, basic front walls, and all basic ends.

See also:

4011 (conservation of Ni in pre-enameling Ni flash)
4332 (differential thermal analysis of clays)
4399 (metal-ceramic seals in vacuum tubes)
4415 (glass-melting furnace)
4691 (heats of formation of Ba aluminates)
4776 (silicone-rubber bonding to glass and ceramics)

23. LUBRICATION AND FRICTION

4552* Distribution of Pressure on Bearing Surfaces. (In Russian.) E. A. Krasil'shihikova. *Doklady Akademii Nauk SSSR*, new ser., v. 74, Aug. 11, 1951, p. 747-750.

A mathematical analysis of the above problem is presented. Includes diagrams.

4553 Chemicals Used in Lubricating Oils and Greases. W. E. Kuhn. *Chemical and Engineering News*, v. 30, Mar. 10, 1952, p. 979-983.

Discusses the use of additives of various types to enhance the performance characteristics of lubricants. Includes tabular statistical data.

4554 Tailored to Fit. *Chemical Week*, v. 70, Mar. 1, 1952, p. 28, 30, 32.

Describes a new, high-molecular-weight petroleum sulfonate—one of a series of synthesized sulfonates. Its use as a lubricating-oil additive is the product's highest commercial prospect.

4555* Some Methods of and Results Obtained by Evaluating Used Railroad Diesel Engine Oil. L. A. Wendt. *Diesel Power and Diesel Transportation*, Feb. 1952, p. 44-48.

Includes diagrams, graphs, and illustrations.

4556* Modern Techniques in Petroleum Testing. VI. Development of Engine Tests for Lubricating Oils. J. G. Withers. *Institute of Petroleum Review*, v. 6, Jan. 1952, p. 3-8.

Outlines the main performance characteristics of lubricating oils which must be examined to estimate its probable behavior in service.

4557* Military Lubricants—Their Consolidation and Requirements. Carl W. Kelley. *Institute Spokesman*, v. 15, Feb. 1952, p. 20-21, 23, 25-26.

A detailed survey and discussion of military specifications and standards for petroleum. Deals with individual items and groups of items covering development, policy, planning, and interservice coordination.

4558* Lubrication of Antifriction Bearings Operating in Difficult Conditions. M. J. Brand. *Microtechnic* (English Ed.), v. 5, Nov.-Dec. 1951, p. 404-423. (Translated from the French.)

Discusses the above for combating difficulties encountered because of high rotational speed, high temperatures, maintenance, humidity, dust or corrosive gases, high load, absence of internal play in preloaded bearings, very small and constant frictional torque. Includes frequency, type, quantity, and method of lubrication.

4559 Soap Structure of Lubricating Greases Revealed by Electron Microscope. Ralph R. Matthews. *Petroleum Processing*, v. 7, Feb. 1952, p. 181-182.

Briefly discusses recent work on the above.

4560* Preliminary Experiments on Coefficient of Friction of Ball-Bearing Rollers of Belt Conveyors in Domestic Industry. (In Russian.) T. S. Burchak. *Ugol*, v. 26, May 1951, p 25-28.

Various types of bearings were tested. Data are discussed and charted.

4561* Requirements of Friction Bearings, Especially Those Made of Synthetic Resins. (In German.) Heinrich Mäkelt. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 94, Feb. 11, 1952, p. 138-145.

Review of literature compares the properties and qualities of different metallic and nonmetallic bearing materials. Includes metallic materials and graphites. Illustrations, graphs, and tables are presented. 45 ref.

Miscellaneous Publications

4562 Bonding of Molybdenum Disulfide to Various Materials to Form a Solid Lubricating Film. I. The Bonding Mechanism. Douglas Godfrey and Edmond E. Bisson. National Advisory Committee for Aeronautics, Technical Note 2628, 16 pages. (TL570 Un3t)

An experimental investigation was conducted to determine the mechanism of bonding of MoS_2 and to extend application of the bonding of MoS_2 to a variety of materials. Studies were made of the adherence of dry MoS_2 powder to steel and aluminum; the physical and chemical nature of dusted, rubbed, and bonded MoS_2 films; chemical reactions in the bonding mechanism; and application of MoS_2 to a variety of metals and to glass. Qualitative tests to determine relative adherence of MoS_2 to materials were conducted. Electron diffraction was employed to detect chemical composition of solid lubricating films and presence of preferred orientation of MoS_2. Tables and graphs.

See also:
4564 (design of sleeve bearings)

24. DESIGN

4563* Elastic Instability of a Swept Panel. E. H. Mansfield. *Aircraft Engineering*, v. 24, Feb. 1952, p. 48-49.

A theoretical and mathematical analysis of the buckling tendency of a panel of the top skin of an aircraft wing.

4564* Calculations and Design of Sleeve Bearings. Adolf Klemencic. *Journal of American Society of Naval Engineers, Inc.*, v. 64, Feb. 1952, p. 104-120.

Shows how, through a logical method of analysis and without the necessity for materials of higher quality, load capacity can be raised and, through reduction in dimensions, material can be saved. Data on the various characteristics are given for the bearing designer. 10 ref.

4565* Analysis of Industrial Design and Drawing Practice. C. A. Gladman. *Australasian Engineer*, Jan. 7, 1952, p. 57-63.

Gives the results of an analysis of the design and drawing practice techniques adopted by 13 Australian engineering organizations. The design problem used for the analysis was a small hydrostatic valve, and each participating firm was requested to examine the specified overall functioning and assembly requirements and to assign appropriate dimensions and tolerances to the drawings provided. Includes outline of each firm's analysis.

4566* The Lateral Stability of Unrestrained Beams. A. R. Flint. *Engineering*, v. 173, Jan. 18, 1952, p. 65-67; Jan. 25, 1952, p. 99-102.

In order to check existing and extended theory, a series of tests on model and small standard beams was carried out in the Engineering Laboratories of the University of Bristol, in which lateral stability was studied under controlled conditions. It is apparent from the results of these tests that existing theory may be readily used to estimate critical values of point loads. Graphs and illustrations.

4567* Increase in Adhesion of Shrink Fits by Surface Oxidation. F. Wenck. *Engineers' Digest*, v. 13, Jan. 1952, p. 13-15, 28. (Translated and condensed from *Werkstattstechnik und Maschinenbau*, v. 41, Sept. 1951, p. 359-361.)

Deals with the influence of surface layers on shrink fits subjected to torsional load. Evidence is submitted on the decrease of adhesion due to oil films on the steel surfaces and on the increase due to oxide layers.

4568* Regenerative Braking of Hydraulically-Driven Centrifuges. P. C. W. Pulles. *Engineers' Digest*, v. 13, Jan. 1952, p. 17-18. (Translated and condensed from *Ingenieur*, v. 65, Oct. 26, 1951, p. 59-62.)

Discusses the principle of regenerative braking and gives details of the hydraulic system.

4569* A New Rotary Seal for High-Speed and High-Pressure Applications. T. J. McCuistion. *India Rubber World*, v. 125, Feb. 1952, p. 575-578, 581.

Describes theory and experimental details in the development of the above. Includes a consideration of compound characteristics. Refered to as R"O"TO seals, they are fabricated from a type of synthetic rubber.

4570* A Study of an Analogous Model Giving the Nonlinear Characteristics in the Buckling Theory of Sandwich Cylinders. Chi-Teh Wang and G. V. R. Rao. *Journal of the Aeronautical Sciences*, v. 19, Feb. 1952, p. 93-100.

A mathematical treatment. 10 ref.

4571 Elastic Rubber Cushion Springs for Torque Load Applications. *Product Engineering*, v. 23, Mar. 1952, p. 119-123.

Discusses applications, and describes a torsion spring which consists basically of rubber parts in the form of cylinders that are contained within the spaces between concentric outer and inner shells or sleeves of polygonal cross-sections.

4572 Design of Coupled Overhung Shafts. H. C. Hesse. *Product Engineering*, v. 23, Mar. 1952, p. 175-179.

If the sections of a coupled shaft are made of dissimilar materials and/or have different diameters, calculation of critical speeds becomes a complex procedure. Describes a graphical-mathematical method which simplifies this task.

4573 Reaction Forces on Bevel Gear Drives. Paul F. Horbatt. *Product Engineering*, v. 23, Mar. 1952, p. 199, 201, 203.

Discusses the above. Includes 2 charts prepared to help the designer calculate the direction and magnitude of axial and radial load components.

Miscellaneous Publications

4574 Equal-Strength Design of Tension-Field Webs and Uprights. Ralph H. Upson, George M. Phelps, and Tung-Sheng Liu. National Advisory Committee for Aeronautics, Technical Note 2548, Jan. 1952, 46 pages. (TL570 Un3t)

A method is presented for proportioning thin-web beams to attain equal strength of web and uprights which may in turn be employed toward optimum design of these components. Improved empirical formulas for this purpose are developed and the results checked by experimental loading of 6 beams. The empirical formulas developed are subject to the limitations of the imposed conditions of this investigation and proportions of uprights as brought out in the experimental results and conclusions. Test specimens were constructed of Al alloy. Illustrations, graphs, and tables.

4575 Design of Two-Dimensional Channels With Prescribed Velocity Distributions Along the Channel Walls. I. Relaxation Solutions. John D. Stanitz. National Advisory Committee for Aeronautics, Technical Note 2544, Jan. 1952, 69 pages. (TL570 Un3t)

A general method of design is developed for two-dimensional unbranched channels with prescribed velocities as a function of arc length along the channel walls. The method is developed for both incompressible and compressible, irrotational, nonviscous flow. Data are tabulated and charted.

4576 Stresses and Deformations in Wings Subjected to Torsion. B. F. Ruffner and Eloise Hout. National Advisory Committee for Aeronautics, Technical Note 2600, Feb. 1592, 79 pages. (TL570 Un3t)

An approximate method for solving the basic equations of Kármán and Chien was developed and applied to the calculation of angles of twist and stresses in torsion boxes of rectangular, elliptical, and airfoil cross section. Data are tabulated and graphed. 18 ref.

4577 Achievement of Continuous Wall Curvature in Design of Two-Dimensional Symmetrical Supersonic Nozzles. J. C. Evvard and Lawrence R. Marcus. National Advisory Committee for Aeronautics, Technical Note 2616, Jan. 1952, 8 pages. (TL570 Un3t)

Auxiliary boundary conditions are derived to assure continuity of wall curvature in applying the method of characteristics to the design of two-dimensional symmetrical supersonic nozzles. An illustrative example is included. Graphs.

4578 Deflection and Stress Analysis of Thin Solid Wings of Arbitrary Plan Form With Particular Reference to Delta Wings. Manuel Stein, J. Edward Anderson, and John M. Hedgepeth. National Advisory Committee for Aeronautics, Technical Note 2621, Feb. 1952, 53 pages. (TL570 Un3t)

A mathematical treatment.

Books

4579 Technicheskie Usloviia na Kontrol i Sortirovku Detalei Avtomobilia ZIS-5. (Specifications for Inspection and Classification of Parts of the ZIS-5 Automobile.) 299 pages. 1949. Department of Automotive Transportation of the RSFSR, Moscow and Leningrad, U.S.S.R. (TL159 T22u)

Presents detailed information on tolerances in inspection of parts, permissible wear, and methods of repairing worn parts of above automobile during general overhauling. Instructions are tabulated for each part and the parts are illustrated schematically.

4580 Inzhenerno-Geologicheskie Issledovaniia dlia Gidroenergeticheskogo Stroitel'stva. (Engineering-Geologic Investigations for Hydroelectric Power Construction.) Vol. II. I. V. Popov, editor. 350 pages. 1950. Government Publishing House for Geological Literature, Moscow, U.S.S.R. (TC160 P81i)

Intended as a handbook for design of hydroelectric installations. Describes the correct selection of amount, type, and methods of investigation, depending on geological circumstances, stage of the investigation, and special characteristics of the desired installation. 110 ref.

See also:
3935 (design consideration for W-carbide tools)
4160 (design of 100 RE rail and joint bars)
4166 (design of propellers for ships)
4396 (engineering nomographs—book)
4917 (design of swept and unswept wings)
5001 (economic evaluation of parts design)
5037 (design of coastal structures)

25. CHEMICAL TECHNOLOGY

4581* The Testing of Printing Inks. W. C. Walker. *American Ink Maker*, v. 30, Feb. 1952, p. 34-36, 66-67.

Gives properties required of printing ink and discusses evaluation tests involving color, fineness of grind, flow properties, drying time, rub resistance, and permanence.

4582* Hydrocarbons From Carbon Monoxide and Steam. (In German.) H. Köbel and FR. Englehardt. *Angewandte Chemie*, v. 64, Jan. 21, 1952, p. 54-58.

Describes experimental work on one-stage conversion of CO and H_2O to paraffin hydrocarbons and oxygen-containing compounds using catalysts from the 8th group of the periodic table, at normal or high pressures, and at 410-500°F. Data are charted and tabulated. 13 ref.

4583 Many Automotive and Aviation Uses for Hydraulic Fluids. *Automotive Industries*, v. 106, Mar. 1, 1952, p. 50, 66.

Discusses properties, requirements, and applications.

4584* Technique of Hydrogenation of Carbon Monoxide. (In German.) Heinrich Tramm. *Brennstoff-Chemie*, v. 33, Jan. 23, 1952, p. 21-30; *Erdöl und Kohle*, v. 5, Jan. 1952, p. 10-17.

Reviews briefly each of several apparatus and methods for the above. Discusses yields from an economic point of view. 12 ref.

4585* Pressure Gasification of Solid Fuels. (In German.) F. Danulat. *Brennstoff-Wärme-Kraft*, v. 4, Jan. 1952, p. 2-6.

Describes principles, present status, and uses of above. Diagrams, graphs, and tables are presented. 24 ref.

4586* Chemical and Physical Properties of Acetylene With Respect to Its Use. (In German.) M. Konschak. *Brennstoff-Wärme-Kraft*, v. 4, Feb. 1952, p. 62-66.

Above includes discussion of heat of formation, production, cause of explosions, explosions in acetylene generators and acetylene tanks, and the safety effect of use of porous masses. Illustrations, graphs, and tables.

4587 Chemicals by Electric Oxidation. *Canadian Chemical Processing*, v. 36, Feb. 1952, p. 36-37.

Discusses increased sodium chlorate and potassium chlorate production by Electric Reduction Co., Canada, by above method.

4588 Aromatic Hydrocarbons From Petroleum. E. L. Metcalf. *Canadian Chemical Processing*, v. 36, Feb. 1952, p. 50, 52-53.

The method described is a continuous process, producing a light hydroformate consisting of benzene, toluene, and xylene fractions. Equipment operates at 900-1000°F. and at pressures

25. *Chemical Technology*

of 200-300 psi. In addition to the aromatic solvents outlined, hydroforming also produces high-grade motor and aviation gasoline, which is sulfur free, and contains negligible quantities of gum-forming olefins.

4589 New Tall Oil Rosin. *Canadian Chemical Processing*, v. 36, Feb. 1952, p. 60-61.

Describes by-product of kraft paper which is the starting material for varnishes, interior enamels, soaps, etc.

4590 New Processes and Technology, 1950-51. *Chemical Engineering*, v. 59, Feb. 1952, p. 185-190.

Presents a listing of 190 new or newsworthy developments in fats, oils, textile fibers, inorganics, fine organics, petroleum, and rubber introduced or commercialized during 1950-51.

4591 DDT Eyes Fluosulfonic Process. *Chemical Engineering*, v. 59, Feb. 1952, p. 247-248.

Describes Naugatuck's new continuous DDT process which uses fluosulfonic acid instead of sulfuric. Advantages mentioned are less capital investment, lower production costs, and higher yields.

4592 Getting Wax From Sugar Cane. *Chemical Engineering*, v. 59, Feb. 1952, p. 272, 274-276.

Describes American process (solvent extraction) and Australian process (vacuum distillation and chromic bleaching) for the above.

4593 Limiting Flow and Holdup in a Spray Extraction Column. G. W. Minard and A. I. Johnson. *Chemical Engineering Progress* (Engineering Section) v. 48, Feb. 1952, p. 62-74.

The problem of limiting-flow conditions in a spray tower of the design proposed by Elgin and Glanding was investigated. An attempt was made to establish a relation for limiting flow at "rejection" rather than at "flooding." Numerous diagrams, illustrations, and formulas. Data are graphed and tabulated. 12 ref.

4594 Fine-Size, Close-Specific-Gravity Solid Separation With the Liquid-Solid Cyclone. J. J. Moder and D. A. Dahlstrom. *Chemical Engineering Progress* (Engineering Section), v. 48, Feb. 1952, p. 75-88.

Demonstrates the above. Design of liquid-solid cyclones for optimum solids separation is considered. The necessary recommendations and equations are presented to construct cyclones for any separation problem. Effects of particle size, gravity difference between solid and liquid, and distribution of the feed slurry to the overflow and underflow streams are treated. Results are presented in graphical form. Predicted results based on the experimental conclusions are compared with actual cyclone achievements on an industrial material. 12 ref.

4595 Three Ways to Phthalic. *Chemical Week*, v. 70, Feb. 23, 1952, p. 40, 42.

Both I.C.I. and Sherwin-Williams are putting their faith in fluid-bed phthalic plants. Main points of difference in commercial processes lie between the two starting with naphthalene. Several companies are also looking at ortho-xylene as raw material for fluid-bed phthalic plants.

4596* Low Boiling Petroleum Fractions in the Gas Industry. *Coke and Gas*, Feb. 1952, p. 61-64.

Discusses the characteristics, availability, and economics of use for gas supply of the propane and butane fractions obtained from petroleum.

4597* A New Method of Sulphur Recovery. *Coke and Gas*, Feb. 1952, p. 71-73.

Describes a continuous dry purification process, using pelleted oxide, which is in operation in Germany.

4598* Fluids for Hydraulic Power Transmission. A. E. Bingham. *Engineering*, v. 173, Feb. 15, 1952, p. 213-215; Feb. 22, 1952, p. 254-255.

Presents results of investigation of the above. Characteristics of various types are tabulated.

4599 Fluid Flow Through Packed Columns. Sabri Ergun. *Chemical Engineering Progress* (Engineering Section), v. 48, 1952, p. 89-94.

Reviews information on the flow of fluids through beds of granular solids. States that pressure losses are caused by simultaneous kinetic and viscous energy losses, and gives an equation applicable to all types of flow. A new concept of friction factor is discussed, and experimental results obtained for the purpose of testing the validity of the equation are reported. Numerous other data taken from the literature are included in the discussions. 27 ref.

4600 Drying of Gases; Adsorption Wave in Desiccant Beds. Stanley H. Jury, and William Licht, Jr. *Chemical Engineering Progress* (Engineering Section), v. 48, Feb. 1952, p. 102-109.

Introduces a generalized theory of the above and presents results of an investigation of the kinetic mechanism of the reaction between humid air and the granular desiccant, anhydrous $CaSO_4$. Plots of the experimentally determined adsorption waves are given for various sets of operating conditions as controlled by the variables: gas velocity, granule size, and length of bed. An analysis of the plots is presented, in which the generalized theory as well as other available means are employed. 23 ref.

4601* Increasing the Efficiency of Catalysts for Gas Reactions. (In German.) O. Reitlinger. *Chemie-Ingenieur-Technik*, v. 24, Jan. 1952, p. 1-2.

A process is described for increasing the effective surface area of a catalyst, without impeding the flow of the gas, by applying the catalytic material in powder form to impregnated grains, without a binding agent and without application of mechanical pressure. Six examples of important large-scale industrial processes show greatly increased yields.

4602* Basic Principles and New Developments in Atomization Drying. (In German.) Emil Kirschbaum. *Chemie-Ingenieur-Technik*, v. 24, Jan. 1952, p. 3-12.

Describes characteristics of atomization driers. Analyzes dimensions of the particles which make up the dry powder. Photomicrographs show the effects of various factors on particle size, which in turn determine the values for heat and material exchange. Equipment is diagrammed. Data are graphed. 11 ref.

4603* Colloidal Structure of Commercial Oil Dispersions. (In German.) Erich H. Kadmer. *Erdöl und Kohle*, v. 4, Dec. 1951, p. 771-777.

Light- and electron-micrographs accompany this discussion of different types of emulsions and degrees of dispersion under different conditions.

4604* Nitric Acid Used for Production of Complex Fertilizers Which Are Easy to Use and Give Good Results. A. Constant. *Farm Chemicals*, v. 115, Feb. 1952, p. 27-29.

Indicates the conditions for the transformation of tri-calcium phosphate into mono-calcium phosphate according to the processes worked out by Société Anonyme des Usines Dior to form nitrated superphosphates called "nitro-phosphates" or "phospho-nitrates."

4605* Improvement of the Dry Method of Removing Sulfur From Coke-Oven Gas. (In German.) Constanz Eymann, Ernst Jaworski, and Kurt Osterloh. *Gas- und Wasserfach*, v. 93, Jan. 1, 1952, p. 22-27.

Discusses analytical studies made to explain the action of the Thiesen equipment for the above and shows that the continuous addition of NH_3 to the gas increases its cleaning effect. Data are tabulated. 32 ref.

4606 A High-Efficiency Corrugated Gauze Packing for Controlled Flow Distillation. Alan J. Hayter. *Industrial Chemist and Chemical Manufacturer*, v. 28, Feb. 1952, p. 59-64.

Presents results of an investigation into the performance and properties of wire-gauze unit packings having high fractionation efficiency. Data are tabulated. 17 ref.

4607* Advances in Coal Technology. *International Chemical Engineering and Process Industries*, v. 33, Feb. 1952, p. 82-84.

Details are given for a wide range of research projects connected with the use of coal as a fuel and as an industrial raw

material. Deals specifically with coal carbonization, including recovery of S from coke-oven gas, gasification of coal, production of oils and chemicals from coal, catalytic synthesis of methane, and Fischer-Tropsch synthesis.

4608* Canadian Research on Chemical Engineering and Industrial Chemistry; National Research Council Issues New Report. *International Chemical Engineering and Process Industries*, v. 33, Feb. 1952, p. 85-87.

Presents summaries, for the above report, of such projects as industrial fermentation, atomic energy, nuclear engineering, oil from tar sands, standardization of paint materials, and research on pure chemistry.

4609* Antibacterial Properties of Phenol Derivatives. R. S. Baichwal, S. C. Jhaveri, and M. L. Khorana. *Journal of Scientific and Industrial Research*, v. 10A, Dec. 1951, p. 498-503.

Reviews the literature on the relationship between the chemical constitution and bactericidal properties of the above. 93 ref.

4610* Utilization of Non-Caking Indian Coal. Part I. Modifying the Viscosity of Tar From Low Temperature Carbonization by Lime Treatment. Part II. Modification of Viscosity of Tar From Low Temperature Carbonization by Dehydration. Part III. Application of Lime-Tar Reaction to the Briquetting of Tandur Coals. Part IV. Semi-Industrial-Scale Experiments in the Briquetting of Tandur Coal. M. S. Iyengar. *Journal of Scientific & Industrial Research*, v. 11B, Jan. 1952, p. 14-27.

Includes diagrams, graphs, and tabular data. 14 ref.

4611* Utilization of Byproducts & Waste Products of the Fatty Oil Industry. Part I. Recovery of Nickel From Spent Nickel Catalyst. G. K. Belekar, J. G. Kane, and H. S. Shahani. *Journal of Scientific & Industrial Research*, v. 11B, Jan. 1952, p. 28-30.

Samples of spent Ni catalyst from different factories were analyzed and a method for the recovery of Ni by digesting the spent catalyst with H_2SO_4-HNO_3 mixtures developed. A recovery of 93-98% is reported. 27 ref.

4612* New Process Unveiled. F. Lawrence Resen. *Oil and Gas Journal*, v. 50, Mar. 3, 1952, p. 55-56.

Describes the aromatic-recovery and platforming unit of Eastern States Petroleum Co. The new unit is designed to extract 500 bbl. of various aromatic hydrocarbons from a daily charge of 1000 bbl. of platformate.

4613* Dehydration of Natural Gas by Glycol Injection. J. H. Sullivan. *Oil and Gas Journal*, v. 50, Mar. 3, 1952, p. 70-71.

Deals with the above. Briefly discussed are general applications, uses, and flow process involved in this type system. In addition, performance data are presented on a 50-M.M.c.f.-capacity unit now in operation in Mustang Island field.

4614 Solutions to Finishing Problems. 1. Sinkage in Woodfinishing: Its Cause and Cure. B. M. Letsky. *Paint Manufacture*, v. 22, Feb. 1952, p. 45-49.

Finishing materials and the finishing process are discussed as the major causes of wood sinking. Various resins are discussed as possible wood fillers.

4615* Recovery Evaporation and Burning of Sulphite Waste Liquor in Sweden. Parts I and II. Bengt Brunes. *Paper Trade Journal*, v. 133, Dec. 21, 1951, p. 24-25, 28, 30; Dec. 28, 1951, p. 18-20, 22, 24, 26.

Presents results of scientific studies on Ca-base sulfite wastes. Discusses advantages and disadvantages of specific systems. Diagrams and tables. 22 ref.

4616* Radioactive Isotopes in Petroleum Research. *Petroleum*, v. 15, Mar. 1952, p. 61-66.

Surveys the major uses in petroleum research of both naturally occurring and artificially produced radioactive materials. 19 ref.

4617 Union's Cobalt Molybdate Process for Refining High Sulfur Stocks. Clyde Berg. *Petroleum Processing*, v. 7, Feb. 1952, p. 186-189.

Above process employs catalytic treatment in the presence of a recycle hydrogen stream for production of premium fuels from high-sulfur crudes, as well as from stocks derived from shale and oil sand. The high activity of the catalyst effects virtually complete elimination of S, N_2, and O_2 from the charge stock.

4618* Contribution to Study of the Desalting of Marine Diesel-Engine Fuels. (In French.) Ch. Muller. *Revue de l'Institut Français du Pètrole et Annales des Combustibles Liquides*, v. 7, Jan. 1952, p. 12-14.

First describes an electrometrical method for determining inorganic chlorides in fuel oils. Then describes a process for desalting fuel oils by water washing. The necessary quantity of water has been kept as small as possible in order to make possible desalting of fuel oils on ships at sea.

4619* Study of the Permeability of Paraffin-Coated Papers. (In French.) A. Kreyenbuhl. *Revue de l'Institut Français du Petrole et Annales des Combustibles Liquides*, v. 7, Jan. 1952, p. 15-20.

Deals with permeability to steam, under "tropical" conditions, of different types of paraffined papers as a function of nature of the base and of the impregnating agent. Graphs and tables.

4620* Ion-Exchange Characteristics of Chemically Modified Cotton Fabrics. Carroll L. Hoffpauir and John D. Guthrie. *Textile Research Journal*, v. 20, Sept. 1950, p. 617-620.

Presents results of an investigation on the above. Phosphorylated cotton fabric behaves like a dibasic acid, with acid strength comparable to that of the first and second hydrogens of phosphoric acid. Partially sulfethoxylated cellulose is a strong-acid cation-exchanger, whereas carboxymethylated cellulose and the succinic acid half ester of cellulose are weakly acidic cation-exchangers. Aminoethyl cellulose, a primary amine, and diethyl aminoethyl cellulose, a tertiary amine, are weakly basic anion-exchangers. On treatment with methyl iodide, diethyl aminoethyl cellulose is converted to a quaternary compound which serves as an anion-exchanger of high basic strength. 10 ref.

Books

4621 Iskusstvennoe Zhidkoe Toplivo. Chast I. Gidrogenizatsiia Topliv. (Synthetic Liquid Fuels. Part I. Hydrogenation of Fuels.) I. B. Rapoport. 332 pages. 1949. Government Scientific-Technical Publishing House for Petroleum and Mineral-Fuel Literature, Moscow and Leningrad, U.S.S.R. (TP343 R18i)

Presents cases of chemistry and technology of destructive hydrogenation of liquid and solid fuels. Influences of temperature, pressure, catalysts, and solvent on the process of destructive hydrogenation are thoroughly reviewed on the basis of the literature and the author's experiences. Treatment of the products of hydrogenation for production of gasoline is comprehensively described. Recommended for use of advanced students in the fields of petroleum and chemical engineering, or as a handbook. References follow each chapter.

4622* Chemische Technologie: Organische Technologie. (Chemical Technology) I. Karl Winnacker and Ernst Weingaertner, editors. 911 pages. 1952. Carl Hanser Verlag, Munich, Germany. (QD151 W73c)

This 3rd of 5 volumes deals with the mining and refining of bituminous coal, lignite, peat, and shale rock; the extraction and processing of mineral oil; selective-solvent extraction with emphasis on refining of lubricating oils; production of synthetic fuels by hydrogenation; synthesis of hydrocarbons; uses, processing, and protection of wood; wood cellulose and paper; aliphatic chemicals; synthetic fibers; and the Fischer-Tropsch synthesis. Photomicrographs, diagrams, tables, graphs, and numerous references.

4623 Beet-Sugar Technology. R. A. McGinnis, editor. 594 pages. 1951. Reinhold Publishing Corp., New York. (TP390 M17b)

A comprehensive treatment of the above. Covers in detail the history, economics, and chemical-engineering methods used. The chapters are by experts in the respective topics. Includes list of reference books on the subject.

See also:

4317 ("Light Hydrocarbon Analysis"—book)
4450 (products of coal distillation)
4460 (coal conversion into chemicals)
4469 (utilization of charcoal)
4656 (production of pinane hydroperoxide)
4845 (trace metals in cotton fibers)

25. *Chemical Technology*

4863 (fluid mechanics in chemical engineering)
4996 (new facilities for chemical processing)
4997 (Italian chemical industry)
4998 (economics of chemical expansion)
5030 (book on fungi)

26. CHEMISTRY—GENERAL, INORGANIC, AND PHYSICAL

4624* Comparison Between the Magnetic Behavior of Oxygen and Nitrogen in Organic Chemistry. (In French.) Jean Ploquin. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 21, 1952, p. 436-437.

Presents a study of the similar influences of structure on the diamagnetism of combined nitrogen and on that of oxygen from which the more-or-less multiple and more-or-less ionic character of corresponding bonds can be disclosed by magnetic methods.

4625* Relation Between Rate of Adsorption and Its Isotherm. (In French.) Denis Papée. *Comptes Rendus habdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 21, 1952, p. 437-439.

Presents results of theoretical and experimental study of above and of influencing factors. Curves for two types of alumina (boehmite and bayerite) are presented.

4626* The Order-Disorder Transition in the Crystalline Lattice of Radioactive Minerals. (In French.) Paul Pellas. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 28, 1952, p. 538-540.

In a recent note, the author showed that the above transition observed in certain radioactive minerals occurs under the influence of very intense radiation of heavy particles by the Wigner effect. The fluxes required are evaluated. Discusses conditions required for the transition.

4627* Scattering From Isotropic Colloidal and Macromolecular Systems. (In English.) Gerald Oster and D. P. Riley. *Acta Crystallographica*, v. 5, Jan. 1952, p. 1-6.

Scattering intensity was calculated for independent particles of the form of solid spheres, spherical shells, periodic shells, and various aggregates of spheres; results are compared with the scattering by gases of atoms and molecules. Scattering by non-ideal systems of noninteracting and of repelling spheres is calculated.

4628* The Crystal Structure of Thorium and Zirconium Dihydrides by X-Ray and Neutron Diffraction. (In English.) R. E. Rundle, C. G. Shull and E. O. Wollan. *Acta Crystallographica*, v. 5, Jan. 1952, p. 22-26.

Presents X-ray evidence for the existence of ThH_2, the lattice constants and metal arrangement obtained by X-ray diffraction, and hydrogen positions as determined for both ZrH_2 and ThH_2 by neutron diffraction. In addition, the magnetic susceptibility of ThH_2 was examined. 14 ref.

4629* Active Carriers in Hydrogenation. (In Russian.) D. V. Sokol'skii. *Doklady Akademii Nauk SSSR*, new ser., v. 74, Aug. 11, 1951, p. 823-826.

Experiments were made with various supports for catalysts in hydrogenation processes. Data are discussed, tabulated, and charted.

4630* Electron-Microscope Study of Fine Structures by Means of Their Intensification. (In Russian.) A. V. Bromberg, V. M. Luk'ianovich, V. V. Nemtsova, L. V. Radushkevich, and K. V. Chmutov. *Doklady Akademii Nauk SSSR*, new ser., v. 74, Aug. 11, 1951, p. 827-830.

The structure of sols of V_2O_5 and $AgNO_3$ were investigated. Results are illustrated and discussed.

4631* Experimental Investigation of the Surface Tension of Calcium Amalgams. (In Russian.) P. P. Pugachevich and O. A. Timofeevichova. *Doklady Akademii Nauk SSSR*, new ser., v. 74, Aug. 11, 1951, p. 831-832.

Includes diagram of apparatus and graph of results.

4632* Influence of Method of Preparation of Zinc Oxide On Its Sintering Behavior. (In Russian.) Iu. Sh. Moshkovskii. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 11, 1951, p. 215-216.

Two types of ZnO were studied—one obtained by dissociation of $ZnCO_3$ at 350°C.; the other by vaporization of metallic Zn in the electric arc. Action of promoters was also investigated.

4633* Proton-Ion Reaction Mechanism of Alkylation and Polymerization. (In Russian.) A. V. Topchiev, Ia. M. Paushkin, T. P. Vishniakova, and M. V. Kurashov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 21, 1951, p. 381-384.

Discusses theory of the above, involving oxide catalysis. Significant data for a series of such catalysts are tabulated and charted.

4634* Absolute Isotherms of the Adsorption of Vapors on Silica Gels and Aluminosilicate Gels of Different Structures. (In Russian.) A. V. Kiselev and N. M. Kamakin. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 21, 1951, p. 393-396.

The adsorption of CH_3OH vapors by various gels was studied. Effect of degree of porosity and chemical composition of the gels was investigated. Data are discussed, tabulated, and charted.

4635* A Theoretical Basis of the Kinetics of Gaseous Reactions in Jets. (In Russian.) M. F. Nagiev. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 21, 1951, p. 397-400.

The above theory is developed mathematically.

4636* New Method for Measurement of the Specific Surface Area of Carbon Black. (In Russian.) P. A. Tesner and I. S. Rafal'kes. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 21, 1951, p. 401-403.

Describes kinetic method for the above. Typical results are tabulated in comparison with those of other methods.

4637* The Diffusion of Silver and Bromine Ions in Solid Silver Bromide. (In Russian.) A. Murin and Iu. Taush. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 1, 1951, p. 579-581.

Ag^{110} and Br^{82} were used to study the above at 300°C. Data are discussed and tabulated. 17 ref.

4638* Electron-Microscopic Investigation of the Mechanism of Growth of Particles in V_2O_5 Sols. (In Russian.) A. V. Bromberg, V. M. Luk'ianovich, V. V. Nemtsova, L. V. Radushkevich, and K. V. Chmutov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 1, 1951, p. 615-617.

Results are illustrated and discussed for plain V_2O_5 sols and for $V_2O_5+AgNO_3$ and $V_2O_5+KNO_3$ sols.

4639* Investigation of Aluminum Compounds Formed at High Temperatures. (In Russian.) M. S. Beletskii and M. B. Papoport. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 11, 1951, p. 751-754.

The formation of "subcompounds" at temperatures up to 2000°C. and at 1 mm. Hg was studied. Al_2O was obtained Results are discussed.

4640* Sublimation During the Heating of Silicates in Reducing Media. (In Russian.) P. S. Mamykin, P. V. Gel'd, and N. N. Buinov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 11, 1951, p. 801-804.

The electron microscope was used to study deposits of SiO and SiO_2 produced when various materials containing Si are heated in a vacuum. Results are discussed and illustrated. 11 ref.

4641* Limiting (Ideal) Type of Crystallization Diagrams of Systems With Chemical Compounds. (In Russian.) V. M. Kravchenko. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 21, 1951, p. 885-888.

A rather extensive review of previous work in the above field was made. A temperature-composition diagram was constructed for a system consisting of a series of nitrobenzene compounds with napthalene. The principles evolved can be applied to other systems containing one or more chemical compounds. Data are charted. 12 ref.

4642* The Kinetics of Deactivation of the Framework of Nickel Catalysts and the Relative Rate of Hydrogen Activa-

tion. (In Russian.) L. Kh. Freidlin and K. G. Rudneva. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 1, 1951, p. 59-62.

The effects of dissolved and adsorbed hydrogen on the hydrogenation of benzoquinone were investigated. Data are discussed, tabulated, and charted.

4643* The Theory of Real Solutions. (In Russian.) *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 11, 1951, p. 227-230.

A theory describing real solutions (ionic) was developed. This theory is developed mathematically and calculated values of activity coefficients are compared with experimental data. Results are tabulated and charted.

4644* Oxygen Exchange Between Alcohol Vapors and Dehydration Catalysts. (In Russian.) S. Karpacheva and A. Rozen. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 21, 1951, p. 425-426.

O^{18} was used to study the exchange of oxygen between Al_2O_3 and vapors of alcohol and water. Data are discussed and charted.

4645* Phase Transformations of Barium Titanate Near 120°C. (In Russian.) N. A. Roi. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 1, 1951, p. 545-547.

Results of investigation of the above are tabulated, charted, and discussed.

4646* Thermographic Analysis at High Pressures. (In Russian.) L. G. Berg and I. S. Rassonskaia. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 11, 1951, p. 855-858.

Describes and illustrates apparatus for measuring temperature of dissociation of compounds at high pressures. Data for $Mg(OH_2)$, $Ca(OH)_2$, and similar minerals or compounds are charted, tabulated, and discussed.

4647* Thermodynamics Prerequisites of Three-Component Distillation. (In Russian.) A. M. Rozen. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 11, 1951, p. 863-866.

Presents mathematical analysis and results of its application to several organic liquid mixtures. Data are tabulated and charted.

4648 2,2,3,3-Tetramethylbutane: Heat Capacity, Heats of Transition, Fusion and Sublimation, Vapor Pressure, Entropy and Thermodynamic Functions. D. W. Scott, D. R. Douslin, M. E. Gross, G. D. Oliver, and H. M. Huffman. *Journal of the American Chemical Society*, v. 74, Feb. 20, 1952, p. 883-887.

Presents the results of colorimetric and vapor-pressure measurements by which the necessary entropy value was obtained, and the calculated thermodynamic functions made possible by these experimental results. 18 ref.

4649 Structural Properties of Chromium (III) Iodide and Some Chromium (III) Mixed Halides. L. L. Handy and N. W. Gregory. *Journal of the American Chemical Society*, v. 74, Feb. 20, 1952, p. 891-893.

The crystal structures of anhydrous chromium-(III) iodide and of some chromium (III) mixed halides were investigated.

4650 Preparation of Diborane by the Lithium Aluminum Hydride — Boron Trifluoride Reaction. I. Shapiro, H. G. Weiss, M. Schmich, Sol Skolnik, and G. B. L. Smith. *Journal of the American Chemical Society*, v. 74, Feb. 20, 1952, p. 901-905.

A study of the preparation of diborane by the reaction of lithium aluminum hydride and boron trifluoride etherate in ether reveals that at least two separate reactions are involved in the process. First, the reactants in equimolar quantities form lithium borohydride and aluminum fluoride; then the lithium borohydride reacts with additional BF_3 to give diborane and lithium fluoride.

4651 An Electron Diffraction Investigation of the Structures of the Aminodiboranes $(CH_3)_2NB_2H_5$ and $H_2NB_2H_5$. Kenneth Hedberg and A. J. Stosick. *Journal of the American Chemical Society*, v. 74, Feb. 20, 1952, p. 954-958.

23 references.

4652 Investigation on Surface Properties of Reduced Iron Catalysts for the Synthesis of Ammonia and Correlation With Crystal Sizes and High Pressure Conversion Activities. Anders Nielsen and Hans Bohlbro. *Journal of the American Chemical Society*, v. 74, Feb. 20, 1952, p. 963-966.

12 references.

4653 Factors Involved in Cation Exchange Equilibria. Oscar D. Bonner, William J. Argersinger, Jr., and Arthur W. Davidson. *Journal of the American Chemical Society*, v. 74, Feb. 20, 1952, p. 1044-1047.

Experimental observations show that in an exchange of ions of the same valence the ionic strength of the solution is not constant. Nature of the apparent discrepancy and its variation with composition indicated presence of a non-exchange process as well.

4654* Isolation of Technetium. (In French.) Suzanne Tribalat and Jacqueline Beydon. *Analytica Chimica Acta*, v. 6, Jan. 1952, p. 96-97.

A preliminary report.

4655 Rates and Mechanisms of Substitution in Inorganic Complexes in Solution. Henry Taube. *Chemical Reviews*, v. 50, Feb. 1952, p. 69-126.

Comprehensive survey of the above. Special emphasis on the aspect peculiar to the inorganic field; effect of variation in properties of the central ion on rate of substitution. 295 ref.

4656 New Naval Stores Boost. *Chemical Week*, v. 70, Feb. 23, 1952, p. 31.

Tells of the development of the terpene hydroperoxides (methane and pinane) as cold-rubber catalysts. Describes process devised for commercial manufacture of pinane hydroperoxide.

4657 The Heat of Transport in Binary Regular Solutions. K. G. Denbigh. *Transactions of the Faraday Society*, v. 48, Jan. 1952, p. 1-8.

Compares the thermodynamic and kinetic theories of thermal diffusion in binary liquid mixtures. An interpretation of the heat of transport is given, based on the regular solution model, and it is shown that it may be expressed in terms of molecular-interaction energies. The equations obtained satisfy requirements of the thermodynamic theory. 10 ref.

4658 Induction Periods in Pyrolytic Reactions. K. E. Howlett. *Transactions of the Faraday Society*, v. 48, Jan. 1952, p. 35-38.

The Rice-Herzfeld mechanism for ethane decomposition was reexamined. It is shown to lead to the expectation of short induction periods of observable length at about 850°K. Discusses use of induction periods for estimating velocities of reactions where direct observation is difficult. Examples of this use are given. 18 ref.

4659 The Calcination of Dolomite. Part I. The Kinetics of the Thermal Decomposition of Calcite and of Magnesite. Part II. The Thermal Decomposition of Dolomite. H. T. S. Britton, S. J. Gregg, and G. W. Winsor. *Transactions of the Faraday Society*, v. 48, Jan. 1952, p. 63-75.

In Part I, the above was studied with the aid of an automatically recording sorption balance, over the approximate ranges 720-780°C. for calcite and 540-600°C. for magnesite. The rate of decomposition of both substances agrees reasonably with the Polanyi-Wigner expression. In Part II, the kinetics of the isothermal decomposition in vacuo of 4 specimens of dolomite was studied at a series of temperatures between 640 and 720°C., with the balance referred to in Part I. 14 ref.

4660* Maxima of Polarographic Current Density vs. Voltage Curves. (In German.) M. von Stackelberg. *Fortschritte der Chemischen Forschung*, v. 2, no. 2, 1951, p. 229-272.

A comprehensive descriptive review and correlation of the literature. 42 ref.

4661* New Research on Metal Hydroxides and Oxyhydrates. (In German.) Oskar Glemser. *Fortschritte der Chemischen Forschung*, v. 2, no. 2, 1951, p. 273-310.

A descriptive review and correlation of the literature, with emphasis on structural considerations. 114 ref.

26. *Chemistry—General, Inorganic, and Physical*

4662* Several New Band Spectra of the Radicals PbCl, PbBr, and PbI. (In German.) K. Wieland and R. Newburgh. *Helvetica Physica Acta*, v. 25, no. 1-2, 1952, p. 87-106.

From a vibrational analysis of the above, values for the dissociation energy of the radicals PbX were deduced. 16 ref.

4663 A New Method for the Interpolation of Ternary Vapour-Liquid Equilibrium Data. E. F. G. Herington. *Journal of Applied Chemistry*, v. 2, Jan. 1952, p. 11-19.

Describes a method of plotting the logarithms of activity coefficients of each component in a ternary system which takes advantage of information on the 3 binary systems. A method of interpolation is described and thermodynamic tests for the consistency of the resulting plots are developed.

4664 The Treatment of Binary and Ternary Vapour-Liquid Equilibrium Data on Systems With More Than One Liquid Phase. E. F. G. Herington. *Journal of Applied Chemistry*, v. 2, Jan. 1952, p. 19-23.

The desirability of adopting some common method of plotting vapor-liquid equilibrium data on systems with more than one liquid phase is stressed and attention is drawn to the lack of agreement in published literature. A method of plotting equilibrium data on systems with two or more liquid phases is recommended, and thermodynamic tests for the consistency of experimental data are presented.

4665 The Preparation of Anhydrous Lanthanon Chlorides by High-Temperature Chlorination of Monazite. F. R. Hartley. *Journal of Applied Chemistry*, v. 2, Jan. 1952, p. 24-31.

The reaction between monazite, chlorine, and carbon was investigated at temperatures above the melting point of the mixed lanthanon chlorides. Conditions were established for recovering over 85% of the lanthanons as anhydrous chlorides. The nature of the volatile products was examined, with particular reference to the evolution of elementary phosphorus. Thermodynamics and mechanism of the reactions are discussed.

4666 Physico-Chemical Studies on Dusts. I. A High-Solubility Layer on Silicious Dust Surfaces. D. W. Clelland, W. M. Cumming, and P. D. Ritchie. **II. Nature and Regeneration of the High-Solubility Layer on Silicious Dusts.** D. W. Clelland and P. D. Ritchie. *Journal of Applied Chemistry*, v. 2, Jan. 1952, p. 31-48.

In Part I, the effect of pre-treatment with various salt solutions, acids, and buffers on solubilities of silicous dusts was investigated. Comparative solubility data are given for 5 silicous dusts. Analytical methods are described for estimating "colloidal" and "dissolved" silica in silicic acid dispersions. The effect of addition of metallic Al liquid-silicous dust systems was further investigated, and also the effect of Al upon the composition of the resulting silicic acid dispersions. In Part II, it is shown that the high-solubility layer on silicous dust-particle surfaces is not a surface layer of hydrated silica; evidence is presented that it is a vitreous silica layer of the Beilby type, formed during the production of the dust by crushing and grinding. When the high-solubility layer has been removed from silicious dust particles by solvents, it can be regenerated by a purely mechanical polishing process. 25 ref.

4667* The Physical Toxicity of Chemicals. I. Vapours. J. C. McGowan. *Journal of Applied Chemistry*, Suppl. Issue 2, 1951, p. S120-S126.

Relationships between the physical toxicities of different gases and vapors are given. By means of these relationships, it is possible to estimate the toxicity of other gases and vapors. 31 ref.

4668 Mass-Spectrographic Study of Ionic Reactions in Hydrogen. Raymond L. Murray. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 6-11.

An analysis of the ratios of di- and tri-atomic ions of H, D, and H-D mixtures obtained from a hot-cathode arc discharge in a magnetic field was used to examine the nature of ionic collision and displacement processes. Ion mobility, and consequently the rate of ion-molecule collisions, at constant pressure, were controlled by varying the intensity of the magnetic field.

4669 The Supersaturation of Nitrogen in a Hypersonic Wind Tunnel. I. Faro, T. R. Small, and F. K. Hill. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 40-43.

Tests in a small hypersonic wind tunnel determined critical temperature and pressure conditions for the condensation of pure dry nitrogen and indicated that supersaturation exists at about 30°F.

4670 The Temperature Dependence of Viscosity for Water and Mercury. Preston M. Kampmeyer. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 99-102.

The above study was conducted to correlate smoothed values, as reported in literature, with deviations from experimental data. Theories of Arrhenius, Eyring, and Gauss were utilized. 17 ref.

4671 The Interlayer Binding in Graphite. Robert O. Brennan. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 40-48.

The repulsive energy between layers of the graphite crystal was calculated as an interaction of LCAO molecular orbitals in the layers. Calculated compressibility is in satisfactory agreement with the experimental value. 40 ref.

4672 Application of the Cell Method to the Statistical Thermodynamics of Solutions. I. Prigogine and V. Mathot. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 49-57.

A mathematical treatment of the above assumes that the constituents are spherical in shape, with an isotropic field of force, that the distance of the maximum interaction for AA, BB, and AB pairs is about the same, and that there is random mixing. 17 ref.

4673 The Kinetics of Coordinate Bond Formation. David Garvin and G. B. Kistiakowsky. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 105-113.

A method was developed for determining the rates of very fast gas-phase bimolecular reactions, based on interpretation of the temperature gradients in a flow system similar to that used for study of the reactions of Na vapor and alkyl halides. The kinetics of the reactions between BF_3 and tri-, di-, and monomethylamine to form the corresponding coordinately bonded compounds were studied. 25 ref.

4674 Statistical Thermodynamics of the Transition Region Between Two Phases. II. One Component System With a Plane Interface. Terrell L. Hill. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 141-144.

An approximate statistical theory was used to investigate the nature of the density-transition curve in passing from a 1-component liquid phase to the equilibrium vapor phase. This density curve is related thermodynamically to surface tension, surface energy, location of the surface of tension, and to dependence of surface tension on curvature. 16 ref.

4675 On the Measurement of Vapor Pressures by Effusion. Charles I. Whitman. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 161-164.

Effect of apparatus dimensions on accuracy of vapor-pressure measurements by Knudsen's effusion method is discussed. It is shown that total surface area of a condensed solid phase is not fundamentally related to pressure of the effusing vapor. Equations are derived which may be used to check the pressure of the effusing vapor for saturation. Two cases in the literature are discussed.

4676 The Temperature Dependence of the Solubility of Solid Nonelectrolytes. J. H. Hildebrand. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 190-191.

The solubilities of nonelectrolytes in solutions from which chemical interactions are absent, when plotted as logarithm of mole fraction vs. logarithm of absolute temperature, yield practically straight lines except near the melting point of the solute. This offers a superior method of smoothing out solubility data and of predicting the temperature coefficient of solubility from a single point by comparison with neighboring lines for other solvents. An explanation is given for this behavior.

4677 The Pyramidal B_5H_9 Structure. George H. Duffey. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 194-195.

Discusses probable links in the above.

4678 Mechanical Destruction of Young and Old Foam Films. J. J. Bikerman. *Journal of Physical Chemistry*, v. 56, Feb. 1952, p. 164-165.

Investigation on the above confirmed the expected decrease of the resilience of the film during its aging.

4679 The Retentivity of Charcoals by the Approximate Isotherm Method. The Effect of Moisture on the Retentivity of Methyl Ethyl Ether, Neopentane and Methanol. D. H. Volman and G. J. Doyle. *Journal of Physical Chemistry*, v. 56, Feb. 1952, p. 182-185.

4680 Note on the Displacement Pressure Method for Measuring the Affinity of Liquids for Solids. N. J. DeLollis. *Journal of Physical Chemistry*, v. 56, Feb. 1952, p. 193-194.

Results of investigation indicate that a 3-phase system including 2 immiscible liquids is self-contaminating; when water and benzene come into contact they will dissolve to a small extent in each other, and one or the other will be preferentially adsorbed on the solid phase, depending on whether it is polar or nonpolar.

4681 Chemisorption of Hydrogen on Zinc Oxide-Molybdenum Oxide Catalyst. Evidence of Heterogeneity of the Surface. M. V. C. Sastri and K. V. Ramanathan. *Journal of Physical Chemistry*, v. 56, Feb. 1952, p. 220-224.

Isobaric rates of adsorption of hydrogen at different temperatures were measured and activation energies calculated for the respective temperature intervals. Surface area of the catalyst was determined from the low-temperature adsorption of nitrogen, by application of both the Brunauer-Emmett-Teller and the Harkins-Jura equations. 11 ref.

4682 Cataphoresis Study in Hydrocarbon Oil by Radioactive and Microscopic Methods. Andrew Gemant. *Journal of Physical Chemistry*, v. 56, Feb. 1952, p. 238-243.

Describes results of a study of cataphoresis of various organic and inorganic suspensions in hydrocarbon oil.

4683 Hydrogen Exchange Reactions Over Iron Synthetic Ammonia Catalysts at −195°. J. T. Kummer and P. H. Emmett. *Journal of Physical Chemistry*, v. 56, Feb. 1952, p. 258-261.

The behavior of singly and doubly promoted Fe catalysts were compared for the ortho-para H_2 interconversion and for the H_2-D_2 exchange reaction at −195°C. The work of Emmett and Harkness on the o-p conversion over the doubly promoted catalyst was confirmed by showing that this exchange occurs rapidly on such a catalyst at −195°C. but is very strongly poisoned by the presence of H_2 chemisorbed at about 100°C. 11 ref.

4684 The Ring Method of Measuring Surface Tension for Liquids of High Density and Low Surface Tension. H. W. Fox and C. H. Chrisman, Jr. *Journal of Physical Chemistry*, v. 56, Feb. 1952, p. 284-287.

Evaluates the above and extends existing correction tables to include liquids of high density and low surface tension.

4685* Coagulation Mechanism of the Hydrophobic Sol. Discussion of Test Results With Silver-Halide Sols in *Statu Nascendi*. (In German.) E. Matijevic and B. Tezak. *Kolloid Zeitschrift*, v. 125, Jan. 1952, p. 1-12; disc., p. 13.

Briefly reviews most important coagulation theories, emphasizing the advantages of silver-halide sols and measuring method with sols in the nascent state for research on coagulation problems; discusses effect of various factors on electrolytic coagulation; and presents several examples to show applicability of the coagulation method to determination of complex-forming ions in electrolyte solutions. Data are graphed. 36 ref.

4686* Relationship Between Adhesion and Stability of Dispersed Systems. (In German.) A. Buzágh. *Kolloid Zeitschrift*, v. 125, Jan. 1952, p. 14-21.

Describes determination of adhesion of homodispersed quartz suspensions as a function of particle size; ascribes change of specific adhesion with change in particle size to nonuniform deformation of adsorption layers; and discusses study of stability of homodispersed quartz suspensions and determination of coagulation values of barium chloride for suspensions of varying degrees of dispersion.

4687* Photo-Optical Determination of the Size of Carbon-Black Particles. (In German.) G. Naeser and W. Pepperhoff. *Kolloid Zeitschrift*, v. 125, Jan. 1952, p. 33-34.

Briefly discusses the above. Includes graphs.

4688* Effect of Surface Condition of Solids on the Formation of the Contact Angle at the Solid-Liquid Boundary Planes (Indices of Wetting and Surface Condition.) W. Neudert, H. Röpke, and J. Reitstötter. *Kolloid Zeitschrift*, v. 125, Jan. 1952, p. 35-40.

Describes experimental method of investigating above and presents results in forms of graphs.

4689* Adsorption of Gases at Lowest to Highest Pressure. (In German.) A. V. Antropoff. *Kolloid Zeitschrift*, v. 125, Jan. 1952, p. 40-43.

Shows that experimentally determined adsorption isotherms of A and N_2 agree closely with the computed isotherms. Data are charted.

4690* Purification of Materials by Drawing Off the Eutectic Melt in Glass Filter Capillaries Attached to the Kofler Micro-Melting-Point Apparatus. (In German.) R. Fischer. *Mikrochemie vereinigt mit Mikrochimica Acta*, v. 38, no. 4, 1951, p. 342-347.

Describes above procedure and apparatus. Data obtained are tabulated for a series of organic-compound mixtures.

4691 Heats of Formation of Some Barium Aluminates. R. B. Peppler and E. S. Newman. *Journal of Research of the National Bureau of Standards*, v. 47, Dec. 1951, p. 439-442.

The heats of solution in 2.00 N. HCl of 8 compounds in the system BaO-Al_2O_3-H_2O were determined. From these data and data taken from the literature, the heats of formation of the compounds at 25°C. were calculated. Data are tabulated. 13 ref.

4692 Hydrogen Reduction of Tungsten Trioxide. M. G. Charlton. *Nature*, v. 169, Jan. 19, 1952, p. 109-110.

Presents time curves for the above. Average compositions for the β- and γ-oxides are given.

4693 Infra-Red Studies of Solvent Effects. N. S. Ham, A. L. G. Rees and A. Walsh. *Nature*, v. 169, Jan. 19, 1952, p. 110-111.

Vibrational absorption spectra over the range 4,000-400 cm^{-1} cm. of solutions of iodine in benzene, ether and pyridine are recorded.

4694 Two Types of Inhibition of the Hydrogen-Oxygen Reaction by Hydrocarbons. R. R. Baldwin, N. S. Corney, and R. M. Precious. *Nature*, v. 169, Feb. 2, 1952, p. 201-202.

Studies on the above show a linear relationship between explosion pressure and inhibitor concentration. The effectiveness of the inhibitor was found to be directly proportional to the O_2 concentration and independent of the H_2 concentration.

4695 Studies in Some Fields of Reaction Kinetics. M. G. Evans. *Journal of the Oil & Colour Chemists' Association*, v. 35, Feb. 1952, p. 49-76.

An attempt is made to show something of the interplay of theoretical ideas and experimental observation in some particular fields of reaction kinetics. Includes polymerization reactions.

4696* Moisture Penetration. G. G. Lilley. *Refrigerating Engineering*, v. 60, Feb. 1952, p. 143-145, 196, 198, 200.

Summarizes past work on moisture penetration and indicates where further research appears to be most needed. Shows how a relationship can be expressed between concentration and relative vapor pressure. Using this relationship and an empirical factor for relative humidity, an overall equation linking vapor pressure and moisture concentration is shown, from which it is feasible to deduce a net rate of moisture flow. 11 ref.

4697 Speculations on the Properties of the Silver Halide Crystals. Frederick Seitz. *Reviews of Modern Physics*, v. 23, Oct. 1951, p. 328-352.

Attempts to throw additional light on factors which determine the properties of materials by advancing a series of somewhat speculative ideas concerning the electronic states of the constituents and types of lattice disorder present. 48 ref.

26. *Chemistry—General, Inorganic, and Physical*

4698 Studies on the Ionization Produced by Metallic Salts in Flames. III. Ionic Equilibria in Hydrogen/Air Flames Containing Alkali Metal Salts. IV. The Staiblity of Gaseous Alkali Hydroxides in Flames. H. Smith and T. M. Sugden. *Proceedings of the Royal Society*, ser. A, v. 211, Feb. 7, 1952, p. 31-74.

In Part III, an examination was made of the electron concentration produced when alkali-metal salts are added to various H_2-air flames containing excess H_2. The results show that the variation with respect to flame temperature and ionization potential of alkali metal is very different from that predicted by theory. Describes experimental method devised for estimation of atomic and molecular ions (other than electrons) in flames. The flame is made to form a portion of the dielectric of a simple parallel-plate condenser. In Part IV, the electron concentration produced by the addition of alkali-metal salts to a wide range of H_2-air flames was measured by the method of attenuation of centimetric radio waves. Considerable deviations from predicted behavior were observed. Analysis shows that the results are compatible with removal of a large amount of Cs as hydroxide, but not of K and Na. 32 ref.

4699 Kinetics of the Hydrogen/Oxygen Reaction. II. The Explosion Region in Salt- and Alkali-Coated Vessels. III. The Explosion-Limit Equation and Its Applications. D. R. Warren. *Proceedings of the Royal Society*, ser. A, v. 211, Feb. 7, 1952, p. 86-109.

In Part II, the 1st, 2nd, and 3rd explosion limits for the H_2-O_2 reaction were examined over a wide range of temperature, mixture composition, vessel size, and wall coating. An expression was derived from general chain theory to account for the results obtained. In Part III, the explosion-limit equation is considered, term by term, for evaluation of the various constants. Experimental figures are compared with theoretical expectations. Certain features of the reaction are re-examined in the light of the present work. 23 ref.

4700* Preparation and Crystal Structure of the Disilicides of Several Rare-Earth Metals. (In German.) Georg Brauer and Heinz Haag. *Zeitschrift für anorganische und allgemeine Chemie*, v. 267, Jan. 1952, p. 198-212.

Describes a method of preparing very pure $LaSi_2$, $CeSi_2$, $PrSi_2$, $NdSi_2$, $SmSi_2$, YSi_2, $YbSi_2$ and $ScSi_2$ from the oxides and elementary Si. The silicides were analyzed by X-ray and chemical methods, and densities of the compounds pycnometrically determined. Includes tables and powder diagrams. 21 ref.

4701* Behavior of Titanium, Columbium, and Tantalum Compounds in Hydrochloric Acid as a Basis for a New Preparative Method of Separation. (In German.) Josef Wernet. *Zeitschrift für anorganische und allgemeine Chemie*, v. 267, Jan. 1952, p. 213-237.

To separate Ti from Cb and Ta in form of $(NH_4)_2TiCl_6$, the behavior of several compounds of these elements, especially the oxyhydrates and chlorides, towards highly concentrated HCl, and the reaction of resulting solutions with NH_4Cl, was investigated. Data are graphed and tabulated. 35 ref.

4702* Physical Characteristics of Fine Grained Crystalline Bodies in Connection With Reactions in Their Mixtures. (In Russian.) A. M. Ginstling. *Zhurnal Prikladnoi Khimii*, v. 24, June 1951, p. 566-575.

A study was made of solid-state reactions. One of the basic factors determining reaction rates of powdered non-metallic mixtures is the area of contact between the particles. Emphasis is on nonmetallic compounds, but metallic materials are also mentioned. Data are tabulated. 15 ref.

4703* Dehydrogenating Properties of Certain Clays and of "Opok." (In Russian.) N. Z. Kotelkov. *Zhurnal Prikladnoi Khimii*, v. 24, June 1951, p. 576-582.

Experiments were made on the catalytic dehydrogenation of isopropyl alcohol by the above material, which consists of SiO_2 and a plastic material. Data are discussed, tabulated, and charted. 11 ref.

Books

4704 Surface Chemistry. A. E. Alexander. 70 pages. 1951. Longmans, Green, London. (QD549 A126s)

Presents a short and elementary treatment of the above. Indicates a wide variety of applications.

4705 The Surface Chemistry of Solids. S. J. Gregg. 297 pages. 1951. Reinhold Publishing Co., New York. (QC182 G86s)

Surveys the above. Deals with those chemical and physicochemical phenomena which relate to the activity of the surface of a solid, or to the interface between a solid and a gas, a liquid, or another solid. Chapter references.

4706 Surface Activity. J. L. Moillet and B. Collie. 379 pages. D. Van Nostrand Co., New York. (QD262 M72s)

Concerned with the physical chemistry, technical applications, and chemical constitution of synthetic surface-active agents. Numerous footnote references.

4707 Mellor's Modern Inorganic Chemistry. G. D. Parkes. 967 pages. 1951. Longmans, Green and Co., New York. (QD151 M48m4)

A comprehensive treatment of the above.

4708 Kolloidno-Dispersnaia Mineralogiia. (Colloidal Dispersions in Mineralogy.) I. D. Sedletskii. 114 pages. 1945. Academy of Sciences of the U.S.S.R., Moscow and Leningrad, U.S.S.R. (QE364 Se29k)

This book is of particular interest to naturalists, geologists, mineralogists, soil scientists, geochemists, biologists, geographers, and physical chemists. It introduces new concepts and presents new ideas concerning physicochemical balances which exist in soils, as a result of complex chemical and biochemical reactions.

See also:

3808 (iron silicate-sulfide-oxide systems)
3846 (chemistry of Cb and Ta)
4321 (porosity of adsorbent materials)
4355 (measuring streaming birefringence and dichroism)
4356 (oscilloscope study of adsorption phenomena)
4466 (spectra of fluorine-supported flames)
4590 (developments, 1950-51)
4725 (phosphatide chemistry—book)
4791 (carbon-black structures)
4902 (new energy concept in thermodynamics)

27. CHEMISTRY—ORGANIC

4709* Radical and Ionic Reaction Mechanisms of Alkylation of Aromatic Compounds. (In Russian.) E. A. Vdovtsova and I. P. Tsukervanik. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 1, 1951, p. 61-64.

Discusses the above on the basis of the literature.

4710* Relationship Between Electrical Conductivity and Activity of Catalysts in Alkylation Reactions. (In Russian.) A. V. Topchiev, Ia. M. Paushkin, T. P. Vishniakova, and M. V. Kurashov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 1, 1951, p. 611-613.

The above was investigated experimentally, using H_2SO_4, $H_2SO_4+BF_3$, H_3PO_4, and $H_3PO_4 \cdot BF_3$ as catalysts. Data are discussed, tabulated, and charted.

4711* Absolute Constants of the Rate of Transformation of Hydrocarbons by Different Compositions of Aluminosilicate Catalysts. (In Russian.) K. V. Topchieva. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 1, 1951, p. 635-638.

Cracking of various hydrocarbons by means of different mixtures of SiO_2 and Al_2O_3 was investigated. Data are discussed, tabulated, and charted.

4712* The Transformation of Complex Esters Under the Influence of Aluminosilicates. (In Russian.) R. D. Obolentsev, In. N. Usov, and M. G. Voiskovskaia. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 21, 1951, p. 889-892.

The catalytic decomposition of complex organic compounds containing oxygen was investigated. Data are discussed and tabulated.

4713* Thermal Stability of Certain Sulfur Compounds. (In Russian.) M. G. Rudenko and V. N. Gromova. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 11, 1951, p. 207-209.

The thermal stability of a series of sulfur compounds (sulfides, mercaptans, and thio-compounds) in the pure form and in kerosene solution was studied. Data are discussed and tabulated.

4714* The Mechanism of Exchange of Hydrocarbon Radicals With Molecular Deuterium. (In Russian.) V. V. Voevodskii, G. K. Lavrovskaia, and R. E. Mardaleishvili. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 11, 1951, p. 215-218.

The above (as opposed to exchange of atomic D) was investigated. Data are discussed and charted.

4715* Disproportionation of Isopentane With the Aid of Aluminum Chloride. (In Russian.) Ya. M. Paushkin and L. M. Fleish. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 11, 1951, p. 845-848.

Experimental data are tabulated, charted, and discussed.

4716* Synthesis of Hydrocarbons and Oxygen-Containing Compounds From Water and Carbon Monoxide. (In German.) Herbert Kölbel and Friedrich Engelhardt. *Brennstoff-Chemie*, v. 33, Jan. 23, 1952, p. 13-21; *Erdöl und Kohle*, v. 5, Jan. 1952, p. 1-9.

Describes theoretical study and experiments on the formation of hydrocarbons from H_2O and CO or CO_2 under a variety of conditions. Diagrams, tables, and graphs are presented. 14 ref.

4717 Sulfonylureas and Sulfonylthioureas. Frederick Kurzer. *Chemical Reviews*, v. 50, Feb. 1952, 1-46.

Comprehensive discussion on the above and their uses. Data on formulas, method of synthesis and melting points are tabulated. 196 ref.

4718 Orientation of Substitution in the Benzene Nucleus. Lloyd N. Ferguson. *Chemical Reviews*, v. 50, Feb. 1952, p. 47-67.

Mechanisms are proposed for the electrophilic substitution of mono-substituted benzenes on the basis of kinetic and other data. It was shown that experimental observations concerning the relative reactivity of monosubstituted benzenes and their orientation characteristics can be attributed to the permanent polarization of the aromatic nuclei induced by the substituents, while steric repulsion and polarization by the attacking reagent have second-order effects. 81 ref.

4719 The Azulenes. Maxwell Gordon. *Chemical Reviews*, v. 50, Feb. 1952, p. 127-200.

Surveys the above. Includes methods of synthesis and their properties. 219 ref.

4720* Oxo Syntheses. (In German.) Curt Schuster. *Fortschritte der Chemischen Forschung*, v. 2, no. 2, 1951, p. 311-374.

Presents comprehensive report on the above, covering definitions; history; general description of aspects such as pressure, temperature, catalysts, laboratory and commercial procedures, kinetics, thermodynamics, and reaction mechanisms; and specific descriptions of application to 9 broad types of organic compounds. 86 ref.

4721* Dimerized Linoleic Acid Modified Alkyds. K. K. Sarin, S. L. Kapur, and J. S. Aggarwal. *Journal of Scientific & Industrial Research*, v. 11B, Jan. 1952, p. 31-32.

Discusses the replacement of phthalic anhydride in alkyd resin compositions by dimerized linoleic acid from castor oil. Films dry faster and exhibit greater resistance to the action of water and alkali than those of the original alkyd resin.

4722 Transfer of Hydrogen In Organic Systems. R. P. Linstead, E. A. Braude, P. W. D. Mitchell, K. R. H. Wooldridge, and L. M. Jackman. *Nature*, v. 169, Jan. 19, 1952, p. 100-103.

Discusses the features of the metal-catalyzed hydrogen-transfer between organic compounds. Data are tabulated.

4723* Solubility Considerations for Methane and Ethane in Bradford Crude. C. M. Sherwood and R. F. Nielsen. *Producers Monthly*, v. 16, Feb. 1952, p. 24-32.

Solubility and equilibrium-vaporization constant data are presented for methane in 4 and for ethane in 2 paraffin-base crude mixtures between 70 and 115°F. Apparatus and techniques used for measuring solubilities, viscosities, and shrinkages are described. The effect of solvent molecular weight on equilibrium constants is illustrated, and the validities of existing correlations for expressing effects of the chemical nature of crudes on equilibrium constants are tested by application to the experimental data.

Books

4724 Schmelzpunkt Tabellen Organischer Verbindungen. (Melting-Point Tables for Organic Compounds.) Walther Utermark. 572 pages. 1951. Akademie-Verlag, Berlin, Germany. (QD518 Ut2s)

Presents chemical formulas (condensed and structural), melting points, boiling points, molecular weights, color, specific gravity, physical constants, solubility, important reactions, and Beilstein citations for 3334 organic compounds. Also includes trivial-name and formula indexes.

4725 The Phosphatides. Harold Wittcoff. 564 pages. 1951. Reinhold Publishing Co., New York. (QP801.P45 W78p)

Interprets and describes the nomenclature, isolation, structure proof, properties, synthesis, physical chemistry, enzymic relationships, analysis, sources, biochemistry, medical aspects, metabolic relationships, and commercial utilization of all the known phosphatides. Extensive bibliographies follow each chapter.

See also:
4586 (properties of acetylene)
4590 (developments, 1950-51)
4624 (diamagnetism of O_2 and N_2 in organic compounds)
4633 (mechanism of catalytic alkylation and polymerization)
4642 (hydrogenation of benzaquinone)
4651 (structures of aminodiboranes)
4658 (ethane-decomposition mechanism)
4682 (organic compounds—cataphoresis study)
4738 (polyalkylene sulfides)

28. PLASTICS AND HIGH POLYMERS

4726 Monoradical and Diradical Polymerization of Styrene. D. H. Johnson and A. V. Tobolsky. *Journal of the American Chemical Society*, v. 74, Feb. 20, 1952, p. 938-943.

Presents results of a series of experiments on the above. 18 ref.

4727* Textile Fibers From Synthetic Textiles. George M. Gantz. *American Dyestuff Reporter*, v. 41, Feb. 18, 1952, p. 100-104, 116.

The chemical and physical properties of 4 new textile fibers made from synthetic resins are compared with the natural and regenerated fibers. Also discusses dyeing properties. 10 ref.

4728 Widening Use of Vinyl Co-Polymer Sheet. *British Plastics*, v. 25, Feb. 1952, p. 42-44.

Discusses properties, methods of fabrication, and applications of vinyl/vinylidene chloride material.

4729 Plastics Peeks at Its Future. *Business Week*, Feb. 23, 1952, p. 66-68, 70.

Reviews the past and predicts the future for plastics. Stresses applications.

4730 Tileboard From Canada's Forests. M. W. Duncan. *Canadian Chemical Processing*, v. 36, Feb. 1952, p. 48-49.

Discusses process in which Canadian Masonite is converted, by use of synthetic resins, into a tough but flexible plastic-surfaced tileboard.

4731 Plastigels for Streamlined Converting. *Canadian Chemical Processing*, v. 36, Feb. 1952, p. 62.

Discusses plastigels, which further simplify and streamline coating, dipping and molding operations and make possible greater reductions in capital investment. They may be molded, extruded, embossed, stamped, and calendered cold.

4732* Metal-Surface and Other Fluorocarbon Combinations. Merritt A. Rudner. *Electrical Manufacturing*, v. 49, Mar. 1952, p. 106-110, 282, 284, 286, 288.

Manufacturing techniques now permit practically unlimited "custom-built" combinations of fluorocarbon polymers with a wide range of metals and various organic and inorganic materials. Properties of Teflon and similar fluorocarbon polymers are first reviewed, indicating advantages and disadvantages for various applications. Two basic techniques are then outlined for securing different properties for specific applications: application of metallic layers or laminates to the resinous material;

28. *Plastics and High Polymers*

or use of metallic or ceramic powders as fillers. A variety of unusual applications of the products is surveyed.

4733 Fibres From Aromatic Polyesters. J. R. Whinfield. *Endeavour*, v. 11, Jan. 1952, p. 29-32.

Discusses fundamental research on synthetic high polymers. Emphasizes an investigation of the preparation and properties of polymerized ethylene terephthalate.

4734 The Determination of the Concentration Dependent Diffusion Coefficient for Methylene Chloride in Polystyrene by a Steady State Method. G. S. Park. *Transactions of the Faraday Society*, v. 48, Jan. 1952, p. 11-21.

21 references.

4735 Polymerization of Isobutene by Stannic Chloride. R. G. W. Norrish and K. E. Russell. *Transactions of the Faraday Society*, v. 48, Jan. 1952, p. 91-98.

Kinetic and molecular-weight measurements are reported for the isothermal polymerization of isobutene at low temperatures using $SnCl_4$ as a catalyst and C_2H_5Cl as solvent. Water is used as co-catalyst. Results are interpreted in terms of a carbonium-ion mechanism. 13 ref.

4736* New Alkaline Water-Resistant Corrugated Adhesive. *Fibre Containers and Paperboard Mills*, v. 37, Feb. 1952, p. 67-68.

Describes the above developed by the Hubinger Co., Keokuk, Iowa. Advantages over acid-type water-resistant adhesives are cited.

4737* Graft Copolymers. (In French.) G. Smets and M. Claesen. *Journal of Polymer Science*, v. 8, Mar. 1952, p. 289-311.

Graft vinyl copolymers were prepared by chain transfer reaction between monomer radical and polymer molecule, followed by addition of monomer to the "macro-radical."

4738* Polyalkylene Sulfides. X. The Reaction of Hexamethylenedithiol With 1,3-Butadiene. C. S. Marvel and Harry N. Cripps. *Journal of Polymer Science*, v. 8, Mar. 1952, p. 313-320.

13 references.

4739* Water and Direct-Current Resistance of Polyvinylchloride Insulations. (In German.) Ottmar Leuchs. *Kunststoffe*, v. 41, Oct. 1951, p. 309-320.

Several polyvinylchloride insulating compositions were investigated to determine what composition was most resistant to water and to rectified current. Part I deals with the behavior of plasticized polyvinyl chloride in contact with water. Part II describes behavior of plasticized polyvinyl chloride under simultaneous exposure to water and direct current. Results are tabulated, charted, illustrated, and discussed.

4740* The Refractometric Determination of the Effectiveness of Plasticizers for Polyvinylchlorides. (In German.) W. Knappe and A. Schulz. *Kunststoffe*, v. 41, Oct. 1951, p. 321-324.

Diagrams and describes method for the above. Resulting curves are discussed; advantages of the method are indicated.

4741* The Age of Plastics. (In German.) Hans Beck. *Kunststoffe*, v. 41, Oct. 1951, p. 325-326.

Shows in graphs and tables, that, from the point of view of comparative volumes, the world's production of plastic materials exceeds that of aluminum, or of the 3 heavy metals: Pb, Cu, and Zn.

4742* Lead Stabilizers for Polyvinylchloride Mixtures. (In German.) Erich Escales. *Kunststoffe*, v. 41, Oct. 1951, p. 327-328.

Describes the decomposition mechanism of the above. Properties of various available stabilizers, and their reaction to plasticizers, is indicated.

4743* Araldite-Base Adhesives and Casting Resins. (In German.) Konrad Meyerhans. *Kunststoffe*, v. 41, Nov. 1951, p. 365-373.

Discusses Araldite-type ethoxyline resins and methods of testing their adhesive, physical, and chemical properties. Illustrations, tables, and graphs.

4744* Creep Resistance of Electrical Insulating Materials. (In German.) Erich Wandeberg. *Kunststoffe*, v. 41, Nov. 1951, p. 374-376.

Discusses several different methods for determining the above. Presents results of their comparative evaluation applied to several synthetic-resin insulating materials, and discusses advantages and disadvantages of each.

4745* Plasticizer Problems. (In German.) E. Jenckel. *Kunststoffe*, v. 42, Jan. 1952, p. 1-9.

Critical discussion of published literature on above includes tables and graphs. 35 ref.

4746* Experiences in the Production of Cellular Materials. (In German.) H. Lindemann. *Kunststoffe*, v. 42, Jan. 1952, p. 9-12.

Discusses and illustrates production and properties of cellular (closed-pore) rubberlike materials and polyvinyl chloride.

4747* Contributions to the Fractionation and Viscosity of Phenolic and Cresylic Resins. (In German.) R. E. Vogel. *Kunststoffe*, v. 42, Jan. 1952, p. 17-19.

Describes methods of fractionation as a prerequisite to study of structures of above materials. Viscosity measurements indicate existence of 3-dimensional rather than fibrous molecules. Data are graphed. 10 ref.

4748* Postforming Thermosetting Laminated Plastics. William I. Beach. *Machinery* (London), v. 80, Feb. 14, 1952, p. 280-283.

Discusses forming or bending of laminated plastic sheets as opposed to the forming of plastic parts from the raw material by molding processes.

4749* Determining the Molecular Weight of Polyvinylpyrrolidone in the Ultracentrifuge. (In German.) W. Scholtan. *Makromolekulare Chemie*, v. 7, Jan. 1952, p. 209-235.

Molecular weight of the above polymer was determined by sedimentation experiments in the ultracentrifuge and by diffusion measurements. An equation for the relationship between molecular weight and intrinsic viscosity was found for molecular weights from 10,000 to 200,000. Certain conclusions are drawn as to size and shape of the PVP-molecules. Data are graphed and tabulated. 27 ref.

4750* Determining the Molecular Weight of Polyvinylpyrrolidones (PVP) by Means of Osmotic Pressure and Light Dispersion of Their Solutions. (In German.) J. Hengstenberg and E. Schuch. *Makromolekulare Chemie*, v. 7, Jan. 1952, p. 236-258.

Molecular weights of PVP fractions were determined by means of the osmotic-pressure method for the range 10,000-100,000. For samples of higher molecular weight the values were low because of the inhomogeneity of the fractions. 12 ref.

4751* Fractionation of High Polymers by the Solvent Process. (In German.) O. Fuchs. *Makromolekulare Chemie*, v. 7, Jan. 1952, p. 259-270.

The method previously described for the fractionation of high polymers by gradually dissolving a film obtained from the product to be fractionated was modified in a simple manner so as to obtain absolute distribution curves, while retaining the particular advantages of this method (very quick fractionation and small amount of material required). This was proven experimentally by comparing the distribution curves of a polyvinyl alcohol and a polyvinyl acetate of equal chain length, by comparison with fractionation by precipitation, by fractionation of two different high-molecular weight products and of a mixture of both; and by fractionating the same product with different pairs of liquids. An indirect method for determining the degree of polymerization of polyvinyl alcohols is described. Includes graphs and tabular data.

4752* Remarks on Determination of the Degree of Polymerization of Polyvinylalcohols by Osmotic-Pressure Measurements. (In German.) O. Fuchs. *Makromolekulare Chemie*, v. 7, Jan. 1952, p. 271-273.

Shows that determination of the polymerization degree of polyvinylalcohols by means of the molecular weight of the

polyvinylacetate obtained from them by reacetylation leads to almost the same result as the osmotic measurements described by Staudinger and Warth. Includes tabular data.

4753* Linear and Spherical Colloids in Polyisobutylene Solution. (In German.) H. Staudinger and H. Hellfritz. *Makromolekulare Chemie*, v. 7, Jan. 1952, p. 274-293.

Shows that high-molecular-weight polyisobutylene in good solvents behaves like linear macromolecules, but like a spherical colloid when dissolved in poor solvents at 20°C. An explanation of the phenomena is presented. Includes graphs, tables, and numerous references.

4754* Determination of the Molecular Weights of Polymethacrylic Acid Esters by Means of Sedimentation in the Ultracentrifuge and by Diffusion. (In German.) G. Meyerhoff and G. V. Schulz. *Makromolekulare Chemie*, v. 7, Jan. 1952, p. 294-319.

Methyl methacrylate was polymerized in different mixtures and the polymerizate divided into fractions. From 9 samples, sedimentation constants by means of the ultracentrifuge were measured and diffusion constants determined by means of a newly constructed diffusion cell specially designed for organic solvents. The method makes it possible to obtain sedimentation and diffusion constants down to very low concentrations, so that extrapolation to zero concentration can be done directly from the measured values. Includes tables, graphs, and diagrams. 21 ref.

4755* Plastic Tooling for Aircraft Production; New Phenolic Material Provides Means for Quick, Easy Casting of Wide Variety of Forming Tools. Frank Charity. *Modern Machine Shop*, v. 24, Mar. 1952, p. 144-148, 150.

Describes the process by which low-viscosity phenolic casting resin is currently being used by Western aircraft manufacturers as a means of lowering the cost, without minimizing the quality, of Hydropress form blocks, stretch press dies, drill jigs, check fixtures, assembly jigs, etc.

4756 New Heights Ahead for Plastics. *Modern Plastics*, v. 29, Mar. 1952, p. 93-116, 194, 196, 197, 200, 202, 205, 207, 208, 210, 212, 214.

Presents the following articles dealing mainly with applications for plastics: "The Cross-Country Commuter," Raymond F. Loewy; "Multiple Uses—Wider Markets," Gerald C. Johnson; "Schoolroom of the Future," Jean Otis Reinecke; "Packaged Bathrooms," Michael Saphier; "All-Weather Stadium," Alexander Knowlton; "Changing the Kitchen Scene," Belle Kogan; "Ceramic Tile + Plastics," J. Gordon Lippincott; "Projects for Cellulosics," Carl Sundberg; "Furniture That Grows," Gerald Stahl; "Reinforced Plastics Concepts," J. McLeod Little; "There's a Science to Seating," Robert L. Gruen; and "Disposable Rainwear," Egmont Arens.

4757 End Users Look Ahead. *Modern Plastics*, v. 29, Mar. 1952, p. 118-127.

Presents and discusses information compiled on the basis of interviews with plastics experts of representative major end-users of plastics in various fields. The starting question in most cases was: "What do you see as the outstanding new applications for plastics in the next 5 to 10 years?"

4758 Materials Men Predict. *Modern Plastics*, v. 29, Mar. 1952, p. 128-131, 217-218, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 248, 251, 253, 255-256, 259.

Based on interviews, telephone conversations, and correspondence with development men connected with plastics materials makers. Gives a broad picture of the future possibilities of plastics.

4759 Plastical Archeology. Johan Bjorksten. *Modern Plastics*, v. 29, Mar. 1952, p. 132-135.

Progress in plastics during the 20th Century, as viewed by an archeologist from the vantage point of the year 6943 A.D.

4760 What the Engineers Want. *Modern Plastics*, v. 29, Mar. 1952, p. 137-138, 140-141, 144-146, 263.

To obtain a view of the future of plastics from the engineering angle, a number of typical users of equipment were asked for ideas and suggestions. These are presented and discussed.

4761 Tomorrow's Plastics Technology. Howard E. Fritz. *Modern Plastics*, v. 29, Mar. 1952, p. 149-150, 264, 267.

Deals with the questions, "Where will tomorrow's plastics come from?" and "What will we do with them?"

4761a Resins As Finishing Agents. D. G. Patterson, E. B. Detwiler, and T. J. Suen. *Modern Plastics*, v. 29, Mar. 1952, p. 151-152, 154, 156, 158, 160, 162, 164, 270, 272, 275.

Discusses the uses of urea- and melamine-formaldehyde resins in improving the quality or properties of paper, textiles, and leather.

4762 Paint Brush Manufacture. *Paint Manufacture*, v. 22, Jan. 1952, p. 60-62.

Briefly surveys claims of the nylon manufacturers.

4763 Codification of Synthetic Resins. *Paint Technology*, v. 17, Feb. 1952, p. 75-76.

Presents a method for the above proposed by the Surface Coating Synthetic Resin Mfr's Assn. Assigns letters and numbers to define the reactants present and to indicate properties without providing full quantitative data on constitution or manufacturing technique. Resins with similar code numbers have similar solubilities and are similar in viscosity and drying characteristics. Gives examples.

4764* The Extrusion of Polystyrene. II. (Concluded.) W. C. Goggin and J. N. McDonald, Jr. *Plastics*, Feb. 1952, p. 35-37.

Presents a discussion on die design, take-off equipment, and the cooling of the extruded material.

4765* Ethoxyline Resins. II. E. Preiswerk. *Plastics*, Feb. 1952, p. 43-46.

Gives data on "Araldite" Casting Resin B in comparison with other synthetic resins. Includes data on the influence of filler on Araldite.

4766* Successful Designing for Plastics Moulding. XIX. W. M. Halliday. *Plastics*, Feb. 1952, p. 55-57.

Deals with some of the errors commonly made in design where sleeve inserts and pin mountings are concerned. (To be continued.)

4767 Better Ways of Evaluating Properties of Plastics. Rolf Buchdahl and L. E. Nielsen. *Product Engineering*, v. 23, Mar. 1952, p. 130-134.

Describes methods, developed for obtaining mechanical properties in terms of well-defined physical quantities, and which cover use and processing temperature ranges.

4768* Extrusion of Vinyl Film. Albert M. Stover. *SPE Journal*, v. 8, Feb. 1952, p. 13-14, 24.

Describes a process whereby vinyl film or sheeting can be produced in any desired thickness ranging from 0.020 to 0.0003 in. Physical test data on various films are given.

4769* High Impact Styrene and Copolymers. Paul M. Elliot. *SPE Journal*, v. 8, Feb. 1952, p. 15-17.

Reviews the growth of the above industry. Various products and their properties are discussed.

4770* The Chemical Attack on Polymeric Materials As Modified by Diffusion. Sidney M. Katz, Edward T. Kubu, and James H. Wakelin. *Textile Research Journal*, v. 20, Nov. 1950, p. 754-760.

Presents derivation of an equation expressing the extent to which a bimolecular chemical reaction within a textile fiber is modified by the diffusion process. Application of the resulting equation to experimental results is discussed.

Book

4771 Kunststoff-Taschenbuch. (Handbook of Synthetic Resins.) Ed. 8. Hj. Saechtling and W. Zebrowski. 271 pages. 1950. Carl Hanser Verlag, Munich, Germany. (TP986A2 P11k8)

Describes available raw materials, semifinished and finished products, and methods of processing and shaping them; discusses production, properties, and uses of a great variety of standard and special plastics; and presents standards and properties in tabular and graphic form. Concluding chapter lists trade name products and their producers.

28. *Plastics and High Polymers*

See also:
3873 (resins in foundry practice)
3944 (bakelite-impregnated wooden forming dies)
4051 (Al-vinyl plastic coating for steel structures)
4528 (resin bonded glass fibers)
4614 (resins as wood fillers)
4695 (polymerization reactions—kinetics of)
4773 (blowing agents in production of porous plastics)
4789 (Ti pigments in plastic compositions)

29. RUBBERS AND OTHER ELASTOMERS

4772* Laws of the Development of Highly Elastic Deformation. (In Russian.) L. V. Chumakova and P. A. Rebinder. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 11, 1951, p. 239-242.

A mathematical analysis of large elastic deformations is presented. The results are compared with experimental data on natural and synthetic rubber. Data are tabulated and charted.

4773* Development and Importance of Blowing Agents in the Production of Foam Rubber and Plastics. (In German.) F. Lober. *Angewandte Chemie*, v. 64, Feb. 7, 1952, p. 65-76.

Reviews literature on the use of familiar organic and inorganic blowing agents for above purpose. Data are tabulated. Numerous references.

4774* Elementary Aspects of Rubber Abrasion. A. Schallamach. *Engineering*, v. 173, Feb. 15, 1952, p. 217-218.

Presents results of an investigation on the above.

4775* Rubber Conveyor Belting: Part I. Types, Constructions, Selection. *Flow*, v. 7, Mar. 1952, p. 64-67, 84, 86, 88, 90-91.

Covers construction, available types, and requirements for determining belt specifications.

4776 Silicone Rubber Can Now Be Bonded. Robert Smith-Johannsen. *General Electric Review*, v. 55, Mar. 1952, p. 54-57.

Discusses the above and presents tabular data showing what silicone to use for specific adhesive purposes. Includes glass, ceramics, and metals.

4777 Use of Rubber Latex in Cement Compounds. Leslie H. Griffiths. *India Rubber Journal*, v. 122, Feb. 23, 1952, p. 8-11.

Describes the nature of rubber latex and discusses its use and advantages for the above.

4777a* "Carbowax" Compounds and Polyethylene Glycols Aid in Rubber Fabricating. C. P. McClelland. *India Rubber World*, v. 125, Feb. 1952, p. 579-581.

Discusses briefly the chemical nature and physical properties of the above compounds. Applications include foam-rubber molding, latex-products lubrication, mechanical-goods molding, and lubrication of tire air bags.

4778* Mechanical Stability Testing of Hevea Latex. E. W. Madge, H. M. Collier, and I. H. Duckworth. *Transactions of Institution of Rubber Industry*, v. 28, Feb. 1952, p. 15-26.

Describes an apparatus developed for the above. Various factors relating both to the instrument and to the method of test are discussed; and the influence of these factors on the accuracy of the results is considered.

4779* Relationships Between the Physical Properties of Rubber Used in Engineering. S. G. Leontein. *Transactions of Institution of Rubber Industry*, v. 28, Feb. 1952, p. 27-72.

A general equation is developed whereby approximate values of the material constants can be calculated taking into account the static strain imposed, the shape factor, and dynamic stiffening. The results are graphed in such a manner that the data can be used in solving general problems. Using this empirical method of approach, it is possible to predict fairly accurately the mechanical properties of a rubber compound under operating conditions, when its composition is known. 20 ref.

4780 Instrumentation of a Synthetic Rubber Plant. J. S. Detwiler. *Instruments*, v. 25, Feb. 1952, p. 185-189.

Development of the control system for the synthetic-rubber reactor shows how experience and design entered into the solution to a difficult problem. The reactor control system and the complete synthetic-rubber process are discussed. (To be continued.)

4781 A Physical Theory of Rubber Reinforcement. A. M. Bueche. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 154-155.

Discusses stiffening produced by the introduction of solid fillers into elastomers. Outlines briefly the method of treatment and compares the results with pertinent data in the literature.

4782* Absolute Propagation Rates in Emulsion Polymerization. III. Styrene and Isoprene. Maurice Morton, P. P. Salatiello, and H. Landfield. *Journal of Polymer Science*, v. 8, Mar. 1952, p. 279-287.

Describes a study of styrene and isoprene monomers, using potassium persulfate and hydroperoxide-polyamine initiators.

4783* Copolymerization Theory of the Vulcanization of Rubber. VI. Hydrogen Sulfide Effects and Some Self-Limiting Features. David Craig, A. E. Juve, W. L. Davidson, W. L. Semon, and D. C. Hay. *Journal of Polymer Science*, v. 8, Mar. 1952, p. 321-335.

Vulcanization with sulfur is ascribed to the formation of sulfur radicals which are believed to copolymerize with the rubber-molecule double bonds. H_2S is believed necessary for chain initiation; but when formed in sufficient amounts may serve as a chain terminator. 42 ref.

4784* Mutual Effect of Rubber and Filler in the Deformation of Vulcanizates. (In German.) J. Kruse. *Kautschuk und Gummi*, Jan. 1952, p. WT1-WT3.

Discusses briefly physicochemical studies of the strength-increasing effect of fillers.

4785* Properties of Rubber Vulcanizates and Cord Subjected to Rapid Deformations. (In German.) Primus Kainradl and Franz Händler. *Kautschuk und Gummi*, Jan. 1952, p. WT3-WT9.

Shows that customary testing methods are not representative of actual conditions to which tires are subjected. Describes equipment and procedures for testing vulcanized rubber subjected to rapid vibrations under a variety of conditions. Includes photographs, diagrams, tables, and graphs. 12 ref.

4786* Determination of the Bursting Resistance of Artificial Leather and Other Flat Elastic Synthetic Products. (In German.) H. Mendrzyk. *Kunststoffe*, v. 42, Jan. 1952, p. 13-16.

Proposes elimination of the difficulties of tensile tests by forcing a circular piece of the material through the opening of a bell-shaped testing device. The device is illustrated; typical data are tabulated.

4787* The Mechanism of Abrasion of Rubber Soles. (In Russian.) P. S. Pushkin. *Legkaia Promyshlennost*, v. 11, May 1951, p. 29-30.

A study was made of the above. Results are discussed and illustrated.

4788 Experiments on the Mechanics of Rubber. I. Eversion of a Tube. A. N. Gent and R. S. Rivlin. *Proceedings of the Physical Society*, v. 65, Sec. B, Feb. 1, 1952, p. 118-121.

Measurements were made of changes which take place in the dimensions of rubber tubes when they are turned inside out. These are compared with values predicted from the theory of large elastic deformations of incompressible isotropic materials.

4789 The Application of Titanium Pigments in Rubber and Plastic Compositions. Joseph Breckley. *Rubber Age*, v. 70, Feb. 1952, p. 597-605.

TiO_2 pigments of rutile type were found to have greater tinting and opacifying strengths than anatase oxides. White rubber and plastics will withstand exposure to light and weather most successfully when pigmented with the rutile pigments, particularly the "chalk-resistant" grades. The nonwater dispersible types of titanium pigments form the most stable pigment-in-water dispersions. Data are graphed and tabulated.

4790 Testing Butyl Reclaimed Rubber. E. B. Busenburg. *Rubber Age*, v. 70, Feb. 1952, p. 608.

Presents data on some tests for the detection of contamination in scrap rubber.

4791 A Midcentury Review of Rubber Carbons. H. A. Braendle. *Rugger Age*, v. 70, Feb. 1952, p. 609-616.

Presents the above. Includes a survey on crystallite structure and carbon gel theory. 29 ref.

4792 Extraction Operations in the Processing of Rubber. L. F. Street. *Rubber Age*, v. 70, Feb. 1952, p. 617-618.

Describes an apparatus for the above.

4793* The Problem of Vulcanization of Rubber. (In Russian.) N. L. Nemirovskii. *Zhurnal Prikladnoi Khimii*, v. 24, June 1951, p. 674-677.

The above was studied experimentally with various additions to the rubber. Data are discussed, tabulated, and charted.

Book

4794 A Practical Manual of Rubber Hardness Testing. A. L. Soden. 49 pages. Maclaren & Sons, London. (TS1890 So15p)

Discusses some practical details concerned with hardness testing of soft vulcanized rubber, chiefly from the aspect of the use, adjustment, and calibration of the main types of apparatus for this purpose.

See also:
4569 (rubber compounds in rotary seals)
4590 (developments, 1950-51)
4746 (production of cellular rubbers)
4805 (rubber latex paints)

30. PAINTS, VARNISHES, LACQUERS, AND ENAMELS

4795 Drying Oils for the Paint Industry. L. A. Jordan. *Chemistry & Industry*, Feb. 2, 1952, p. 92-94.

Deals with the present supply position and outlook for drying oils.

4796 Refinery Painting. W. B. Cook. *Corrosion* (Technical Section), v. 8, Mar. 1952, p. 93-99.

Selection of surface-preparation methods and paint-coating systems to provide the best economic results for protection, decorative effect, and other benefits to be derived from the application of paints and coatings to surfaces exposed to specific refinery conditions, are discussed.

4797* Some Short Cuts in Pigment Testing Methods. John G. Weinmann. *Engineering & Chemical Digest*, v. 3, Dec. 1951, p. 440-444. (Reprinted from *By Gum.*)

Describes techniques for the above. Typical data are tabulated.

4798* Automatic Spray Painting. Part III and IV. P. C. Bardin. *Industrial Finishing*, v. 27, May 1951, p. 50-52, 54, 56, 58, 60; June 1951, p. 28-30, 32, 34, 36.

Part III illustrates and describes a number of rotary-table types of automatic spraying machines. Part IV discusses electrostatic spray painting.

4799* Where Wood Finishing Has Been Improved. Joseph A. Hager. *Industrial Finishing*, July 1951, p. 58-60, 62, 66, 68-69. (A condensation.)

Surveys the advances in the above. Discusses some characteristics of present-day materials such as synthetic resins, solvents, plasticizers, etc.

4800* Roller Coating. P. C. Bardin. *Industrial Finishing*, v. 27, Aug. 1951, p. 12-14, 18, 20, 22, 24, 28, 30, 32.

Describes a rapid and economical method of applying paint coatings or adhesives to thin flat panels of uniform thickness and to long ribbons of sheet metal, paper or fabric as they unwind from and wind onto large spools or reels.

4801* Lacquer or Baked Enamel for Pressed Metal Parts. *Industrial Finishing*, v. 28, Nov. 1951, p. 59-60, 62.

Discusses the pros and cons for each of the above.

4802 A Survey of Special Purpose Coatings. Edward Engel. *Organic Finishing*, v. 13, Feb. 1952, p. 11-13, 16.

Above survey includes wrinkle finishes, polychrome metallic finishes, flock, luminous paints, decals or transfers, and stencil-finishing. Briefly mentions their behavior on metal surfaces.

4803 Organic Coatings for Plaster. Thomas A. Dickinson. *Organic Finishing*, v. 13, Feb. 1952, p. 14-16.

Describes the characteristics and gives the applications of a furan resin coating compound which enables the cheapest plaster casting to attain the strength and durability of wood.

4804 Fundamentals of Film Formation and Properties. Henry Fleming Payne. *Paint, Oil & Chemical Review*, v. 115, Feb. 1952, p. 10-12, 14, 30, 32-36.

4805 Synthetic Rubber Latex Paints. J. Rinse. *Paint Technology*, v. 17, Feb. 1952, p. 55-59, 65.

Discusses film formation, properties, pigmentation, preparation, and application of types of latex which can be used without curing. Several of the most important commercial products are mentioned, and a survey is given of data from the literature, including available manufacturers' bulletins, avoiding contradictory and less important statements.

4806 Sebacic Acid and Its Derivatives Used in Coatings. *Paint Technology*, v. 17, Feb. 1952, p. 61-65.

Discusses properties and production of the above from ricinoleic acid. Gives concentrated information (products, yield, properties, uses), on its various salts, esters, amides, etc.

4807 Synthetics Up to Date. *Paint Technology*, v. 17, Feb. 1952, p. 71-74.

Describes method for making neutral phthalates. Discusses constituents of polishes, emulsifying agents, wrinkle finishes, fire-retardant coatings, plasticizers, and lacquers.

4808 New Synthetic Resins and Derivatives. *Paint Technology*, v. 17, Feb. 1952, p. 77-83, 85-90.

Presents review of recent patent literature on the above as applied to production, properties, composition, and applications of surface-coating resins.

4809 Platy Pigments in Paint Systems. Max Kronstein, George P. MacNiece, and Marion M. Ward. *Paint and Varnish Production*, v. 42, Feb. 1952, p. 18-27.

Part I is concerned with experimental results of paint systems containing platy extenders in salt-fog exposure as compared to corresponding paint systems containing other types of extenders or no extenders at all. Part II deals with the effect of these extenders on moisture resistance. Data are tabulated.

4810 Fatty Acid Requirements in Paints and Resins. Henry M. Enterline. *Paint and Varnish Production*, v. 42, Feb. 1952, p. 34.

Briefly discusses types used, and properties desired.

4811* Protection of Iron by Painting. (In German.) Manfred Ragg. *Werkstoffe und Korrosion*, v. 3, Jan. 1952, p. 11-17.

Discusses properties and qualities of different paints and paint ingredients as protective coatings. Data are tabulated.

See also:
4054 (protective paint coatings for steel structures)
4216 (effect of cathodic protection on paint)
4762 (nylon paint-brush manufacture)
4990 (lithographic lacquer)
4991 (linseed vs. synthetic lithographic varnishes)

31. AGRICULTURAL RESEARCH

4812* Use of Radioactive Isotope P^{32} in Study of the Phosphate Nutrition of Plants. (In French.) Georges Barbier and Christiane Husson. *Comptes Rendus hebdomdaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 126-128.

Outlines results of above study, giving details of procedure and summary of observations.

31. *Agricultural Research*

4813* Autoradiographs Reveal Course Taken by Added Plant Nutrients. J. D. Sayre. *Agricultural Chemicals*, v. 7, Mar. 1952, p. 34-36.

The above series show the distribution and location of some of the elements that accumulate in the corn leaf.

4814* Soil Use of Insecticides. Victor A. Tiedjens. *Agricultural Chemicals*, v. 7, Mar. 1952, p. 45-47, 118-120.

Surveys the development of insecticide-fertilizer mixtures and their use for soil pest control. Deals with aldrin formulations in particular.

4815* Summer Seeding of Alfalfa and Esparette. (In Russian.) I. D. Kolesnik. *Agrobiologia*, Jan.-Feb. 1951, p. 40-44.

The harvest of hay and seed from summer plantings was compared with that from spring plantings. Planting with and without cover crops were included in the study. Results are tabulated and illustrated.

4816* Ways for Continuous Improvement of Soil Fertility. (In Russian.) T. S. Mal'tsev. *Agrobiologia*, Jan.-Feb. 1951, p. 140-145.

Discusses crop rotation and the application of fertilizers in order to obtain continuously increasing yields of various crops.

4817* Influence of Growing Conditions of Tomatoes on the Typical Quality of Seeds. (In Russian.) D. D. Brezhnev. *Agrobiologia*, Jan.-Feb. 1951, p. 154-156.

The influence of growing conditions on the tendency of tomatoes to stay true-to-type was studied for several types of tomatoes. Data are discussed and tabulated.

4818* Root Feeding of Plants and Microorganisms. (In Russian.) L. M. Dorosinskii. *Agrobiologia*, Mar.-Apr. 1951, p. 40-48.

A study was made of the influence of various microorganisms in soil on the growth of plants. Data are tabulated and illustrated.

4819* Increase of the Secondary Action of Phosphates. (In Russian.) F. V. Chirikov. *Agrobiologia*, Mar.-Apr. 1951, p. 104-112.

Experiments were made on the utilization of phosphorus from superphosphate by plants grown under various conditions, with and without nitrogen additions. Data are discussed and tabulated.

4820* The Question of the Role of Calcium Interchange in Connection With Phosphate Ions in Soils. (In Russian.) V. M. Klechkovskii and G. N. Zherdetskaia. *Doklady Akademii Nauk SSSR*, new ser., v. 74, Aug. 11, 1951, p. 843-846.

P^{32} was used to study the exchange of Ca and P in various soils. Data are discused and tabulated.

4821* Non-Root Fertilization of Plants With Boron. (In Russian.) V. V. Iakovleva. *Doklady Akademii Nauk SSSR*, new ser., v. 79, Aug. 21, 1951, p. 1009-1012.

Refers to fertilization by spraying or dusting. Tests were made on the growth of clover when fertilized with boron. Tests included addition of boron to the soil as well as by spraying the leaves with a H_3BO_3 solution. Tables and photographs. 10 ref.

4822* The Importance of the Length of Periods of Darkness in the Development of Plants. (In Russian.) V. I. Razumov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 11, 1951, p. 269-271.

The effect of different cycles of light and darkness on several plants was studied. Data are discussed and tabulated.

4823* The Fixation and Leaching of Boron Fertilizers in Soils. (In Russian.) M. V. Katalymov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Sept. 21, 1951, p. 413-416.

The ability of various soils to retain boron fertilizer was studied by laboratory experiments. Data are discussed and tabulated.

4824* Effectiveness of Growth Stimulants at Various Levels of Phosphate Fertilization of Plants. (In Russian.) M. M. Mazaeva. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 21, 1951, p. 957-960.

A study was made of the increased growth of tomatoes by heterauxin and β-indolyl-butyric acid with different amounts of P in the soil. Data are tabulated.

4825* The Transpiration of Plants With Various Degrees of Soil Moisture. (In Russian.) M. F. Lobov. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 1, 1951, p. 101-104.

Experiments on the above showed that the intensiveness of transpiration depends on the water supply of the plant. Results are discussed from the point of view of more economical irrigation. Data are tabulated. 14 ref.

4826* Effects of 2,4-D on Dry Weight, Reducing Sugars, Total Sugars, Polysaccharides, Nitrogen, and Allyl Sulfide in Wild Garlic. Glenn C. Klingman and Gilbert H. Ahlgren. *Botanical Gazette*, v. 113, Dec. 1951, p. 119-134.

Presents results of study of the above made to further our understanding of the effects of 2,4-D on the physiology and chemical components of plants. 27 ref.

4827* New Growth-Regulating Compounds. II. Substituted Benzoic Acids. C. E. Minarik, D. Ready, A. G. Norman, H. E. Thompson, and J. Fred Owings, Jr. *Botanical Gazette*, v. 113, Dec. 1952, p. 135-147.

Presents results of an investigation in which more than 200 substituted benzoic acids were tested for inhibitory activity. Includes tabular data.

4828* Effect of Boron on Germination of Flax Seed and on Respiration of Flax Seedlings. William Jensen. *Botanical Gazette*, v. 113, Dec. 1951, p. 180-185.

4829* Virus Diseases of Tobacco Mosaic and Potato Yellow Dwarf Not Controlled by Certain Purified Antibiotics. Helen Purdy Beale and Carolyn R. Jones. *Contributions From Boyce Thompson Institute*, v. 16, Oct.-Dec. 1951, p. 395-407.

Solutions of the purified antibiotics, sodium penicillin, streptomycin sulfate, chloramphenicol, aureomycin hydrochloride, or sodium terramycin were introduced by means of a wick into Turkish tobacco or Indian tobacco and the plants were inoculated later with tobacco-mosaic virus and the virus of potato yellow dwarf, respectively. The same antibiotics were tested *in vitro* for the possible inactivation of tobacco-mosiac virus. Results are tabulated and discussed.

4830 Some Aspects of Insecticide Biochemistry. F. P. W. Winteringham. *Endeavour*, v. 11, Jan. 1952, p. 22-28.

Discusses food contamination due to residue insecticides and mechanisms of insecticidal action. 22 ref.

4831* Chemists From All Sections of the United States Report on Their Experiments With Radioisotopes. *Farm Chemicals*, v. 115, Feb. 1952, p. 15-18.

Included in the review are papers on the use of radio-phosphorus to determine the phosphorus fertility status of soils, and in studying minor-element deficiency and chlorosis. Another deals with the influence of fertilizer material and placement on utilization of fertilizer phosphorus by crops on calcareous soils.

4832* Some Hidden Secrets of Plant Nutrition; Accumulation of Radioisotopes in Corn Leaves. *Fertilizer Review*, v. 28, Jan.-Feb.-Mar., 1952, p. 8-9.

Presents a study of the above carried out at the Ohio Agricultural Experiment Station in an attempt to find out more about leaf-deficiency and toxicity symptoms. It is possible by using high-specific-activity isotopes, or those almost carrier-free, to study the movement, accumulation, and location of the elements when they are used in such small amounts that they cannot be detected by ordinary means.

4833* The Movement of a Radio-Phosphorus-Labelled Insecticide in Groundnut Plants. L. H. Stein, Tikvah Alper, and E. E. Anderssen. *Journal of Science of Food and Agriculture*, v. 3, Jan. 1952, p. 31-37.

Discusses test procedure and results of the above.

4834* Some Organo-Mercury Compounds of Amides & Imides as Fungicides. N. V. Subba Rao. *Journal of Scientific & Industrial Research*, v. 11B, Jan. 1952, p. 8-9.

Three organo-mercury derivatives of amides and imides were tested as fungicides in the control of foot-rot of paddy and compared with Ceresan, a proprietary organo-mercury fungicide.

4835 Similar Joint Action of Insecticides. P. S. Hewlett and R. L. Plackett. *Nature*, v. 169, Feb. 2, 1952, p. 198-199.

Presents a survey on the joint action of poisons. Describes calculation of combined toxicity of insecticide mixtures. Some experimental data are given.

4836 Production of Rust-Resistant *Vulgare* Wheats by Backcrossing. Ahmed Afifi. *Nature*, v. 169, Feb. 2, 1952, p. 200-201.

Describes the above. Positive results are interesting in view of the fact that the two parent plants under the same conditions are definitely susceptible to rust.

4837 Influence of Sulphur Nutrition on Leaf Morphology. M. Chessin. *Nature*, v. 169, Feb. 23, 1952, p. 332-333.

Deals with the influence of sulfur nutrition on tobacco mosaic virus. The number of local lesions per unit leaf area was used as the criterion of susceptibility to the virus. Procedure involved the rubbing of a suspension of the virus on selected leaves of the test plant.

4838* Growth Regulators During Fertilization and Post-Fertilization Periods. A. E. Murneek. *Palestine Journal of Botany*, ser. R, v. 8, Nov. 1951, p. 8-19.

Presents a summary of the present status of studies on the function of hormones in sexual reproduction of some crop plants. Emphasis was placed on the use of synthetic growth regulators with certain cultural practices of horticultural plants. 99 ref.

4839* Magnesium Deficiency of Shamouti Orange Trees and Its Treatment. Lotte Heymann-Herschberg. *Palestine Journal of Botany*, ser. R, v. 8, Nov. 1951, p. 76-83.

Chlorosis appearing on Shamouti orange trees on light soils in Israel was diagnosed as Mg deficiency by aid of external leaf symptoms and leaf composition. The beneficial effect of Mg-salts was enhanced by addition of minor elements (Fe, Zn, Mn) to the spraying solution, while the same micronutrient elements, when applied alone did not improve leaf color. 23 ref.

4840* Investigation on Injury to Plants From Air Pollution in the Los Angeles Area. A. J. Haagen-Smit, Ellis F. Darley, Milton Zaitlin, Herbert Hull, and Wilfred Noble. *Plant Physiology*, v. 27, Jan. 1952, p. 18-34.

Spinach, beet, endive, oat, and alfalfa plants were used for determination of crop-damaging pollutants in the air of metropolitan Los Angeles. These investigations demonstrate the utility of plants in analyzing air pollutants. They further show for the first time that hydrocarbons, normally considered harmless air pollutants, can cause severe damage through their reaction with substances known to be in the air. 12 ref.

4841* Aerosol Insecticides; Their Evaluation Against House Flies, Cockroaches. Part I. A. C. Miller, Arnold Mallis, and R. V. Sharpless. *Soap and Sanitary Chemicals*, v. 28, Feb. 1952, p. 151, 153, 181.

The above study is concerned with liquified gas-propelled aerosols. Various factors in the development of test methods are considered. (To be continued.)

4842* A Nonstationary Method for Determining Thermal Conductivity of Soil. *in Situ*. D. A. DeVries. *Soil Science*, v. 73, Feb. 1952, p. 83-89.

Describes cylindrical element that can be placed in the soil to measure its thermal conductivity by the above method. Presents some of the results obtained. An important feature is the small diameter of the cylinders, which makes it possible to introduce them into the soil without markedly disturbing its natural structure.

4843* Response of Crop Plants to I and Br. Harvey P. Newton and Stephen J. Toth. *Soil Science*, v. 73, Feb. 1952, p. 127-134.

Above study was made to determine whether tomatoes would respond to I or Br applications to the soil; to determine the residual effects of iodine applications on buckwheat; and to investigate I-Cl and I-Br relationships in plants. Data are tabulated. 15 ref.

4844* Effect of Fumigation on Some Chemical Properties of Soils. D. G. Aldrich and J. P. Martin. *Soil Science*, v. 73, Feb. 1952, p. 149-159.

A study was made of chemical changes produced by partial sterilization of 4 soils with five volatile fumigants and, for comparative purposes, with steam. Treatment with steam, chloropicrin, "D-D," CS_2, propylene oxide, and ethylene dibromide produced an initial increase in ammonia nitrogen in the soil, which on incubation was oxidized to nitrates. The onset of nitrification appeared to be influenced by nature of the soil and of the sterilizing agent. 21 ref.

4845* Trace Metals in Cotton Fiber. D. C. Heinzelman and R. T. O'Connor. *Textile Research Journal*, v. 20, Nov. 1950, p. 805-807.

The lint of 8 varieties of cotton grown in one location and of one variety grown in 13 locations was analyzed for trace metals by the line-width method of spectrochemical analysis to provide compositional data on the presence of metals which are known to catalyze the degradation of cotton cellulose. The spectrograms showed the presence of Al, B, and Zn in trace amounts in all cases, but they did not reveal the presence of Cr, Ni, or Sn.

Book

4846 Grassland and Grassland Products. Stephen J. Watson. 200 pages. 1951. Edward Arnold, London. (SB197 W33g)

Attempts to correlate and summarize material on the above. Presents some of the criteria by which grassland herbage can be judged; and discusses its value. References follow each chapter.

See also:
4310 (test for allethrin and pyrathrins)
4312 (determination of Cu in soils)
4708 (colloidal soil dispersions)
5021 (role of research in agricultural problems)

32. PHYSICS

4847* Calculation of the Efficient Emission Section for Electromagnetic *Bremsstrahlung*. (In French.) Gérard Petiau. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Dec. 19, 1951, p. 1581-1583.

Presents details of above calculations and completes results previously reported on above by summation of the states of polarization of the quanta emitted.

4848* Ionic Transmission Microscopy. (In French.) Maurice Gauzit. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Dec. 19, 1951, p. 1586-1588.

Describes a very simple gun which produces group of very intense Li^+ ions. First results show a defining power of about 200 A. in the ionic image of ZnO crystals, with a direct magnifying power of 12,500. Includes photograph and diagram.

4849* Study of the Degasification of Liquids During Subjection to Ultrasonic Vibrations at 80 and 17.7 Kc./S. (In French.) Brice Derouet. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 71-73.

Degasification of water containing dissolved air of various concentrations was studied as a function of amplitude of ultrasonic vibrations and of pressure over the liquid studied. On the basis of the results, a possible mechanism for formation of bubbles in the liquid is developed; and minimum radius of the bubbles formed was determined.

4850* Electron Levels in Crystalline Phosphors Containing 'Poisoned" Centers. (Fe, Ni, Co). (In French.) Noubar Arpiarian and Daniel Curie. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 2, 1952, p. 75-77.

Presents two types of diagrams of electron levels which make it possible to note the clearly different experimental behavior of Fe and Ni, on the one hand, and of Co on the other.

32. *Physics*

4851* Determination of the Fine Structure of the Dielectric Constant of a Weak Heterogeneous Layer by Reflection Tests. (In French.) Gottfried Eckart. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 14, 1952, p. 309-311.

A mathematical analysis.

4852* Spectral Characteristics of Photocathodes in the Ultraviolet Region Up to 1500 A. (In French.) Vladimar Schwetzoff and Simone Robin. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 14, 1952, p. 316-318.

The above was investigated with respect to Sb-Cs, Sb-K, Sb-Na, Sb-Li, and Ag-O-Cs photocathodes. Results are graphed and discussed.

4853* Diffraction of Light by Two Ultrasonic Waves. (In English.) Ram Ratan Aggarwal and S. Parthasarathy. *Acustica*, v. 1, no. 2, 1951, p. 74-78.

An explanation is offered on the basis of existing theories for the diffraction of light by ultrasonic waves, for the inequalities in intensity recorded in the photographs obtained by Bergmann, when diffraction spectra are obtained by exciting a quartz-crystal simultaneously at two frequencies; these inequalities being in the side-bands of the first-order spectrum excited by high-frequency sound waves.

4854* Use of Ultrasonic Waves for Study of an Aerodynamic Field. (In French.) M. Merle, *Acustica*, v. 1, no. 3, 1951, p. 104-108.

Shows that a narrow bundle of ultrasonic waves (normally directed to the fluid stream of a wind tunnel and the luminous beam, and made visible by the optical method of streaks) permits one to measure Mach's number (by determination of the displacement of the beam), to determine variation of the fluid temperature and also gives useful information about state of the field around a model, of degree of turbulence, Reynolds' criterion for a cylinder, etc.

4855* Photoluminescence of Zinc Sulfide and Selenate Sublimate Phosphors. (In Russian.) K. V. Shalimova. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 1, 1951, p. 587-590.

Results of experiments on the above are charted, illustrated, and discussed.

4856* Heat Exchange in Gaseous Suspensions of Solid Particles. (In Russian.) G. N. Khudiakov and Z. F. Chukhanov. *Doklady Akademii Nauk SSSR*, new ser., v. 80, Oct. 11, 1951, p. 747-750.

The above was experimentally investigated using heated air and very fine sand (75-2310μ) in a cyclone separator. Data are discussed and charted. Apparatus is described and diagrammed.

4857* The Theory of Electrical Arcing Through of Solid Dielectries. (In Russian.) A. A. Vorobév and E. K. Zavadovskaia. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 21, 1951, p. 375-377.

The above theory was developed from considerations of lattice energy, field strength, energy of disassociation, and bonding energy. Some of the relationships are charted.

4858* Mechanical Stresses in Dielectric During Arc Discharge Through Them. (In Russian.) E. K. Zavadovskaia. *Doklady Akademii Nauk SSSR*, new ser., v 81, Dec. 1, 1951, p. 541-543.

The stresses developed in alkali halide salts when subjected to an electric field were determined. Data are discussed and charted.

4859* Velocity of Ultrasonic Waves in Some Binary Mixtures of Organic Liquids. (In Russian.) I. G. Mikhailov and A. A. Chistorazum. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 11, 1951, p. 779-782.

Data for the mixtures $(CH_3)_2CO$-CS_2, CH_3OH-CS_2, CH_3OH-C_6H_6, and $(CH_3)_2CO$-$CHCl_3$, in various proportions, are tabulated, charted, and discussed.

4860 Theoretical Basis of the Bouguer-Beer Law of Radiation Absorption. Frederick C. Strong. *Analytical Chemistry*, v. 24, Feb. 1952, p. 338-342.

A complete derivation of the above is presented, based only upon modern theories of matter and energy. Graphical interpretations are presented, followed by analysis of possible methods of employing the law in practice. Causes of apparent deviation are considered.

4861* The Betatron. *Brown Boveri Review*, v. 28, Sept.-Oct. 1951, p. 260-310.

Entire issue is devoted to a discussion on various aspects of the above. Six articles deal with principles on which the betatron is based, properties of the resulting X-rays, and different possible applications.

4862 Oak Ridge Pile Meets the Press. *Chemical and Engineering News*, v. 30, Feb. 1952, p. 660-661.

A pictorial presentation of the air-cooled, uranium-graphite reactor.

4863 Applications of Fluid Mechanics and Similitude to Scale-Up Problems. Part II. J. H. Rushton. *Chemical Engineering Progress* (Engineering Section), v. 48, Feb. 1952, p. 95-99; disc., p. 99-102.

Reviews the principles of dynamic similitude. Basic concepts of fluid mechanics are used to develop relations between fluid motion, equipment size, and fluid properties that may apply to chemical engineering work. A general method is given whereby the requirements for dynamic similitude for any flowing system can be determined. Several examples are presented in detail. 21 ref.

4864* Supersonic Flow Through Nozzles With Rotational Symmetry. Yu Why Chen. *Communications on Pure and Applied Mathematics*, v. 5, Feb. 1952, p. 57-86.

A theoretical and mathematical analysis. 11 ref.

4865* High-Temperature Arcs. D. W. Rudorff. *Engineers' Digest*, v. 13, Jan. 1952, p. 6-8.

Reports important progress made in the technique of generating high-temperature arcs of the water-cooled type.

4866* Energy Losses in Steam Pipes Due to Pressure Drop. M. Lang. *Engineers' Digest*, v. 13, Jan. 1952, p. 22-23. (Translated and condensed from *Brennstoff-Warme-Kraft*, v. 3, no. 9, Sept. 1951, p. 301-303.)

A procedure is described whereby above energy losses can be determined. A practical example shows that small losses of pressure can cause an appreciable energy loss.

4867 Size Distribution in a Randomly Fractured Solid, and Its Application to Coal. A. B. Manning. *Journal of the Institute of Fuel*, v. 25, Jan. 1952, p. 31-32.

The theory of random subdivision of a magnitude is used to derive an expression for the size distribution of a randomly fractured solid.

4868* New Formulae for Water Flow in Pipes. J. S. Blair. *Institution of Mechanical Engineers, Proceedings* (Hydraulics Group), v. 165, W.E.P. 64, 1951, p. 74-87.

The above apply to new pipes using water at normal temperatures, and cover all classes and sizes of pipes over a very wide range of velocities. Data are graphed and tabulated.

4869* Friction Losses in Turbulent Pipe-Flow. L. E. Prosser, R. C. Worster, and S. T. Bonnington. *Institution of Mechanical Engineers, Proceedings* (Hydraulics Group), v. 165, W.E.P. 64, 1951, p. 88-94; disc., 94-111.

Significant developments in the theory of turbulent flow in smooth and rough pipes are reviewed to establish a rational basis for the commonly accepted logarithmic laws for pipe friction. 14 ref.

4870* Air Drag on Cubes at Mach Numbers 0.5 to 3.5. George E. Hansche and John S. Rinehart. *Journal of the Aeronautical Sciences*, v. 19, Feb. 1952, p. 83-84.

The above study was made in order to obtain an experimental value for the drag coefficient of a cube in flight as a function of Mach Number. The air drag on two sizes of steel cubes, ¾ and ⅝ in., was determined in the approximate Mach range 0.5-3.5.

4871* On Unsteady Nonlinearized Conical Flow. S. F. Borg. *Journal of the Aeronautical Sciences*, v. 19, Feb. 1952, p. 85-92, 100.

It is shown that the equations of unsteady, nonlinear, nonviscous, nonheat-conducting flow may be put in a conical form. The problem of a shock striking an infinite wedge is considered. 21 ref.

4872* Supersonic Flow Around Cones at Large Yaw. G. B. W. Young and C. P. Siska. *Journal of the Aeronautical Sciences*, v. 19, Feb. 1952, p. 111-119, 142.

Equations were developed for flow properties in the region bounded by a supersonic cone body at large angle of attack and its attached shock wave for use with the tabulations of Kopal. Compares theoretical results with the experimental data of Cronvich.

4873* Heat Transfer by Laminar Flow From a Rotating Plate. Knox Millsaps and Karl Pohlhausen. *Journal of the Aeronautical Sciences*, v. 19, Feb. 1952, p. 120-126.

An exact solution of the heat-transfer problem for the von Kármán example of laminar flow of a viscous fluid over a rotating plate is given in dimensionless form and physically discussed. The numerical results are given for Prandtl Numbers 0.5-10.

4874* An Experimental Investigation of the Isothermal Laminar Boundary Layer on a Porous Flat Plate. Paul A. Libby, Lawrence Kaufman, and R. Paul Harrington. *Journal of the Aeronautical Sciences*, v. 19, Feb. 1952, p. 127-134.

The above was measured and compared with laminar boundary-layer analyses carried out in the past several years. The results indicate that porous plates, closely approximating mathematical or ideal porous plates, can be realized and that theoretical velocity profiles are in good agreement with experiment. 20 ref.

4875* Effect of Wind-Tunnel Nozzle on Steady-Flow Nonuniformities. Stanley Corrsin. *Journal of the Aeronautical Sciences*, v. 19, Feb. 1952, p. 135-136.

A mathematical treatment.

4876* On Nonplanar Surfaces of Very Low Aspect Ratio. H. M. Voss. *Journal of the Aeronautical Sciences*, v. 19, Feb. 1952, p. 136-137.

Points out that cases of a nonplanar surface in steady flow or in arbitrary unsteady motion may be equally treated, as long as deflection, and thus downwash, is developable in a finite Fourier series. 11 ref.

4877 Instantaneous Power Spectra. Chester H. Page. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 103-106.

The intuitive concept of a changing spectrum is discussed. The instantaneous power spectrum is defined mathematically and used to make the intuitive concepts more precise.

4878 Heat Transfer in Isotropic Turbulence. Stanley Corrsin. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 113-118.

The postulated problem of heat transfer in a stationary isotropic turbulence under constant small temperature gradient was examined from both Lagrangian and Eulerian points of view. By combination of Taylor's "diffusion by continuous movements" and a new temperature fluctuation equation, it is possible to obtain an expression for the turbulent heat-transfer coefficient which depends only on velocity field, and an approximate expression for the corresponding correlation coefficient which depends only on velocity field and fluid physical properties.

4879 A Direct-Current Network Analyzer for Solving Wave-Equation Boundary-Value Problems. George W. Swenson, Jr. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 126-131.

The analogy between the difference equations of a wave-equation boundary-value problem and the current-law equations of a d.c. network is developed. The determination of characteristic frequencies, characteristic functions, and response to simple harmonic forces is illustrated by solution of an irregularly shaped membrane. Methods are discussed for solving problems involving inhomogeneous or anisotropic media or various types of boundary conditions.

4880 Phenomena Associated With the Flight of Ultra-Speed Pellets. Part I. Ballistics. William A. Allen, John S. Rinehart, and W. C. White. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 132-137.

Small metallic pellets were fired at velocities up to 6 km/sec by means of modified shaped charges. Previous work in this field has been confined largely to observations of meteors and conventional-shaped charges. Data obtained on ballistic phenomena verify the conventional drag force determinations extrapolated to large Mach numbers. It was found that motion of both nonburning and burning pellets can be represented within experimental error by the empirical equation.

4881 The Effect of Pressure on Scintillation Phosphors. A. J. Reinsch, and H. G. Drickamer. *Journal of Applied Physics*, v. 23, Jan. 1952 p. 152-153.

A study was made of the pressure coefficient of cadmium tungstate and anthracene phosphors in the range from atmospheric pressure to 10,000 atm.

4882 The Propagation of Sound Waves Through a Medium With Very Small Random Variations in Refractive Index. T. H. Ellison. *Journal of Atmospheric and Terrestrial Physics*, v. 2, No. 1, 1951, p. 14-21.

Mathematical techniques, developed for the theory of turbulence, are applied to the study of the propagation of waves in a medium in which the refractive index varies slightly with position in a random manner. 11 ref.

4883 Diffusion Through an Interface—Binary System. L. H. Tung and H. G. Drickamer. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 6-9.

Diffusion measurements were made between saturated layers in the system SO_2 —n-heptane, using S^{35} tagged SO_2 as a radioactive tracer. The results are evaluated in terms of interfacial transfer coefficient introduced in a previous paper. Resistance in the interface is significant compared with resistance to ordinary diffusion, even within 4°C. of the critical solution temperature.

4884 Diffusion Through an Interface—Ternary Systems. L. H. Tung and H. G. Drickamer. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 10-12.

Diffusion measurements were made at 22°C and at 40°C in the system phenol-H_2SO_4-water, using S^{35} tagged H_2SO_4 as a radioactive tracer. Relation of the results to practical mass-transfer problems is briefly discussed.

4885 Energy Levels and Rate Processes in the Thallium Activated Potassium Chloride Phosphor. Peter D. Johnson and Ferd E. Williams. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 124-128.

The dependence of spectral distribution and intensity of emission of KC1:T1 on temperature and excitation wavelength are correlated with absorption data and theoretical calculations to provide a detailed picture of energy relationship in this phosphor.

4886 Electrical Conductivity of Silver Sulfide. Malcolm H. Hebb. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 185-190.

Mixed electronic and ionic conduction in silver sulfide is examined. The importance of terminal conditions which may affect the ratio of ionic to electronic currents in experimental measurements is emphasized. Either the electronic or ionic components can be completely suppressed. This is the basis of a new method of measuring ionic and electronic conductivities independently, as functions of chemical potential of the silver component.

4887 The Electric Conductance of Liquid Iron Oxide. J. W. Tomlinson and H. Inouye. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 193.

Describes results of experiments on the above in equilibrium with solid Fe. Results were typical of a semiconductor of the type exemplified by the solid, nonstoichiometric oxides of the transition metals.

4888 Originative and Intensifier Activators in MgO Phosphors. Richard H. Bube and Kenneth F. Stripp. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 193-194.

Results of an investigation on the above support the concept that luminescence caused by an originative activator is associated with the activation as perturbed by neighboring host

32. *Physics*

crystal ions; whereas luminescence caused by an intensifier activator is associated with the host crystal ions perturbed because of the presence of an activating impurity.

4889 A Tentative Interpretation of the Magnetic Behavior of Pr_6O_{11}. Kei Yosida. *Journal of Chemical Physics*, v. 20, Jan. 1952, p. 202.

Briefly discusses the above.

4890 A New Effect Observed in Connection With Electrically "Exploded" Wires. William M. Conn. *Nature*, v. 169, Jan. 26, 1952, p. 150-151.

It was shown that exploding wires may be used for coating glass, etc. They may also serve as convenient sources of light of high intensity and short duration. Recent experiments established the presence of ionization near the wire of the order of 500 times the background.

4891 Fermi Energy of Metallic Lithium. Richard A. Silverman. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 227-230.

A mathematical treatment. 13 ref.

4892 The Absorption of Gamma-Rays from Co^{60}. Sakae Shimizu, Tetsuya Hanai, and Sunao Okamoto. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 290-294.

Measurements of the above were made in 27 elements. In order to exclude errors due to secondary radiations which might be produced in neighboring objects and in the absorbers, particular precautions were taken with respect to the geometrical arrangement of apparatus. 15 ref.

4893 Ferroelectricity and Antiferroelectricity of a Crystal Containing Rotatable Polar Molecules. Yutaka Takagi. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 315-324.

Dielectric properties of a CsCl type crystal made up by insertion of ions into the body center sites of a simple cubic array of rotatable polar molecules were investigated. Owing to the Lorentz field exerted by the dipoles themselves, a nonuniform distribution in orientation of the polar molecules is predicted below a certain critical temperature. It is suggested that most of the phenomenological predictions derived for this model may, qualitatively at least, be valid also for other models which have ions capable of displacement instead of freely rotatable dipoles. 14 ref.

4894 Theory of Antiferromagnetic Resonance. F. Keffer and C. Kittel. *Physical Review*, ser. 2, v. 85, Jan. 15, 1952, p. 329-337.

A mathematical treatment. 17 ref.

4895 Structural Changes in the Ferroelectric Transition of KH_2PO_4. B. C. Frazer and R. Pepinsky. *Physical Review*, ser. 2, v. 85, Feb. 1, 1952, p. 479-480.

Presents results of an investigation of the above. Shows that, as the temperature is lowered through the ferroelectric Curie point, KH_2PO_4 changes from tetragonal symmetry to that of the orthorhombic space group.

4896 The Frequency Spectrum of a Two-Dimensional Ionic Lattice. M. Smollett. *Proceedings of the Physical Society*, v. 65, sec. A, Feb. 1, 1952, p. 109-115.

The above was evaluated. A method is given for calculating the exact density of the spectrum at special points in phase space. Two logarithmic infinities, first found by Montroll using a quasi-elastic forces model, are confirmed for an ionic lattice. The bearing of these infinites on interpretation of 2nd-order Raman spectra is discussed.

4897 Properties of Films of Non-Metallic Antimony. T. S. Moss. *Proceedings of the Physical Society*, v. 65, sec. A, Feb. 1, 1952, p. 147-148.

Presents results of an investigation on the above. Measurements of the temperature dependence of resistance were made; data are shown graphically.

4898 Line Widths in Ferromagnetic Resonance. K. W. H. Stevens. *Proceedings of the Physical Society*, v. 65, sec. A, Feb. 1, 1952, p. 149-150.

Describes another possible mechanism for the above.

4899 An Interpretation of the Magnetic Properties of Some Iron-Oxide Powders. W. P. Osmond. *Proceedings of the Physical Society*, v. 65, sec. B, Feb. 1, 1952, p. 121-134.

The observed magnetic properties of fine dispersed powders of the ferromagnetic iron oxides are discussed in the light of modern theories of the magnetization of ferrites and of ferromagnetics containing nonmagnetic inclusions. The individual powder particles are shown to be probably of single-domain size, and the relative coercivities of γ-ferric oxide powders of nearly spherical and of markedly acicular grains are qualitatively in agreement with theory, on the grounds of shape anisotropy. 17 ref.

4900 Impurity Scattering in Oxide Semiconductors. E. W. J. Mitchell. *Proceedings of the Physical Society*, v. 65, sec. B, Feb. 1, 1952, p. 154-161.

Examines the possibility that the activation energies commonly found for oxides, even allowing those with high concentrations of impurity, are such that the number of neutral centers at room temperature will always be very much greater than the number ionized, so that if impurity scattering plays an important part it must be of type B (ii), that is, scattering from neutral centers. 10 ref.

4901 The Nucleus. Enrico Fermi. *Physics Today*, v. 5, Mar. 1952, p. 6-9.

Based on 6 papers presented during the symposium on contemporary physics which keynoted the Twentieth Anniversary Meeting of the Institute of Physics in Chicago. Discusses nuclear physics with respect to advances in techniques and fundamental knowledge over the past 20 yrs.

4902* New Energy Concept in Thermodynamics Upsets Old Ideas, Promises Advances. *Power*, v. 96, Mar. 1952, p. 74-78, 234.

A theoretical and mathematical presentation of the new thermodynamic concepts advanced by Prof. Neil Bailey of Rensselaer Polytechnic Institute. The accepted concepts of thermodynamics are questioned. The result is a logical revelation of hidden fallacies, and a new, different flow equation, which checks closely with experiments on air and water.

4903 Absorption of Sound in Fluids. Jordan J. Markham and Robert T. Beyer and R. B. Lindsay. *Reviews of Modern Physics*, v. 23, Oct. 1951, p. 353-411.

Comprehensive review of the basic principles and concepts of the above. 3-page bibliography.

4904 Some Aspects of Fission Counter Design. William Baer and O. F. Swift. *Review of Scientific Instruments*, v. 23, Jan. 1952, p. 55-56.

In order to design a more sensitive fission counter than those currently in use, experiments were conducted to determine how sensitivity changes with variation of electrode spacing and U^{235} coating thickness.

4905 General Theory of Small Elastic Deformations Superposed On Finite Elastic Deformations. A. E. Green, R. S. Rivlin, and R. T. Shield. *Proceedings of the Royal Society*, ser. A, v. 211, Feb. 7, 1952, p. 128-154.

A theoretical and mathematical analysis of the above, especially for the case when the finite deformation is purely homogenous.

4906* Gaseous Diffusion and Porosity in Porous Media. C. H. M. Van Bavel. *Soil Science*, v. 73, Feb. 1952, p. 91-104.

Proposes method for the above in which the necessity for corrections of estimated value has been eliminated. A formula for calculating diffusivity is given. 16 ref.

4907* A Numerical Method for Solving the Flow Equation for Water in Unsaturated Materials. Arnold Klute. *Soil Science*, v. 73, Feb. 1952, p. 105-116.

An equation describing the flow of water in unsaturated porous materials was derived from Darcey's law and the equation of continuity. A numerical method of solution of this equation for semi-infiinite horizontal systems of flow was described and applied to several examples. The phenomenon of a wetting front is shown to be indicated when variation of diffusivity with moisture content is considered.

4908* Theory of the Multiple Dispersion of Charged Particles. (In German.) F. Sauter, and H. Wanke. *Zeitschrift für Naturforschung*, v. 7a, Jan. 1952, p. 33-39.

Deals theoretically with dispersion of charged particles passing through matter with the assumption that the energy change in the individual dispersion processes can be disregarded.

4909* Formation of a Gas Mass Rotating About a Central Body. I. Solutions of Hydrodynamic Equations with Turbulent Friction. (In German.) Reimar Lüst. *Zeitschrift für Naturforschung*, v. 7a, Jan. 1952, p. 87-98.

Computation of above is based on the assumption that the radical velocity is small as compared to the absolute velocity, and that the potential of gravitation is determined only by the central body. Includes graphs. 12 ref.

4910* Formation of a Rotating Gas Mass. (In German.) *Zeitschrift für Naturforschung*, v. 7a, Jan. 1952, p. 99-103.

Describes mathematical study of rotating gas mass without a central body and subject to characteristic gravitation and forces of turbulent friction. Data are graphed.

4911* Displacement Structures in Cubic Face-Centered Crystals. II. (In German.) Horst-Dietrich Dietze. *Zeitschrift für Physik*, v. 131, no. 2, 1952, p. 156-169.

Derivation of Peierl's equation is improved. Points of attack of the forces in the slip plane are clarified; hence the atomic structure of the slip plane in Peierl's equation is retained. Data are graphed and tabulated.

4912* Electric Arcs With and Without a High-Intensity Current Spot. (In German.) W. Weizel and W. Thouret. *Zeitschrift für Physik*, v. 131, no. 2, 1952, p. 170-184.

Mathematical expansion and refining of the contraction theory explains a series of experimental facts. Data are graphed.

4913* Wave-Mechanical Theory of Crystal Surfaces Under the Influence of Metallic Electrons. (In German.) Kurt Artmann. *Zeitschrift für Physik*, v. 131, no. 2, 1952, p. 244-268.

Goodwin's calculations are perfected by discussing the natural frequencies of the space lattice in greater detail and by obtaining clearer results for surface conditions in the degenerated case. Includes diagrams and tables. 14 ref.

Miscellaneous Publications

4914 Concerning the Flow About Ring-Shaped Cowlings. Part VIII. Further Measurements on Annular Profiles. Dietrich Küchemann and Johanna Weber. *National Advisory Committee for Aeronautics*, Technical Memorandum 1328, Feb. 1952, 11 pages. (TL570 Un3tm)

4915 A Comparison of the Experimental Subsonic Pressure Distributions About Several Bodies of Revolution With Pressure Distributions Computed by Means of the Linearized Theory. Clarence W. Matthews. National Advisory Committee for Aeronautics, Technical Note 2519, Feb. 1952, 52 pages. (TL570 Un3t)

Presents an analysis of the above. Results show that the theoretical methods predict subsonic pressure-coefficient changes over the central portion of the body, but do not predict pressure-coefficient changes near the nose.

4916 Experimental Determination of Time Constants and Nusselt Numbers for Bare-Wire Thermocouples in High-Velocity Air Streams and Analytic Approximation of Conduction and Radiation Errors. Marvin D. Scadron and Isidore Warshawsky. National Advisory Committee for Aeronautics, Technical Note 2599, Jan. 1952, 81 pages, (TL570 Un3t)

Presents the above. Four pairs of common thermocouple materials as well as three different wire diameters were used. The probes were tested at the exit of a room-temperature jet exhausting into a pressure controlled chamber. The Mach number range was 0.1 to 0.9; the range of Reynolds numbers based on wire diameter was 250 to 30,000. Data are graphed and tabulated. 13 ref.

4917 Charts and Approximate Formulas for the Estimation of Aeroelastic Effects on the Loading of Swept and Unswept Wings. Franklin W. Diederich and Kenneth A. Foss. National Advisory Committee for Aeronautics, Technical Note 2608, 98 pages. (TL570 Un3t)

Presents the above for subsonic and supersonic speeds. Two types of stiffness distributions are considered, one which consists of a variation of the stiffness with the 4th power of the chord and one which is based on an idealized constant-stress structure. Some design considerations brought out by the results are discussed.

4918 Estimate of Slip Effect on Compressible Laminar-Boundary-Layer Skin Friction. Harold Mirels. National Advisory Committee for Aeronautics, Technical Note 2609, Jan. 1952, 22 pages. (TL570 Un3t)

A soultion to Rayleigh's problem for a compressible fluid, with slip boundary conditions, was obtained and related to the flow past a semi-infinite flat plate. Results were interpreted to define the border region between continuum and slip flow and to estimate the effect of slip. 14 ref.

4919 Experimental Investigation of Base Pressure on Blunt-Trailing-Edge Wings at Supersonic Velocities. Dean R. Chapman, William R. Wimbrow, and Robert H. Kester. National Advisory Committee for Aeronautics, Technical Note 2611, Jan. 1952, 53 pages. (TL570 Un3t)

Measurements of base pressure are presented for 29 blunt-trailing-edge wings having an aspect ratio of 3.0 and various airfoil profiles. Numerous tables, graphs and illustrations. 10 ref.

4920 Determination of Indicial Lift and Moment of a Two-Dimensional Pitching Airfoil at Subsonic Mach Numbers From Oscillatory Coefficients With Numeral Calculations For a Mach Number of 0.7. Bernard Mazelsky. National Advisory Committee for Aeronautics, Technical Note 2613, Feb. 1952, 30 pages. (TL570 Un3t)

10 references.

4921 Principle and Application of Complementary Energy Method for Thin Homogeneous and Sandwich Plates and Shells With Finite Deflections. Chi-Teh Wang. National Advisory Committee for Aeronautics, Technical Note 2620, Feb. 1952, 33 pages. (TL570 Un3t)

A mathematical treatment.

4922 Comparison of Supersonic Minimum-Drag Airfoils Determined by Linear and Nonlinear Theory. E. B. Klunker and Keith C. Harder. National Advisory Committee for Aeronautics, Technical Note 2623, Feb. 1952, 19 pages. (TL570 Un3t)

Supersonic profiles of minimum pressure drag for a given thickness ratio and for a given area were determnied with the use of a non-linear pressure relation and are compared with minimum-drag profiles found by linearized theory. Data are graphed.

4923 Analytical and Experimental Investigation of Fully Developed Turbulent Flow of Air in a Smooth Tube With Heat Transfer With Variable Fluid Properties. R. G. Deissler and C. S. Eian. National Advisory Committee for Aeronautics, Technical Note 2629, 43 pages. (TL570 Un3t)

4924 The Similarity Law for Nonsteady Hypersonic Flows and Requirements for the Dynamical Similarity of Related Bodies in Free Flight. Frank M. Hamaker and Thomas J. Wong. National Advisory Committee for Aeronautics, Technical Note 2631, Feb. 1952, 23 pages. (TL570 Un 3t)

Similitude for nonsteady flows is found to depend on the same conditions as for steady flows plus additional conditions derived from the nonsteady motions of the bodies under consideration. The aerodynamic forces and moments are correlated for related shapes by means of this law.

4925 An Analysis of Laminar Free-Convection Flow and Heat Transfer About A Flat Plate Parallel to the Direction of the Generating Body Force. Simon Ostrach. National Advisory Committee for Aeronautics, Technical Note 2635, Feb. 1952, 47 pages. (TL570 Un3t)

The above was formally analyzed and the type of flow is found to be dependent on the Grashof number alone. Velocity and temperature distributions for Prandtl numbers of 0.01, 0.72, 0.733, 1, 2, 10, 100, and 1000 are computed and it is shown that velocities and Nusselt numbers of the order of magnitude

32. *Physics*

of those encountered in forced-convection flows may be obtained in free-convection flows. 13 ref.

4926 Some Graphical Aids in Crystal Physics. Dan Mc Lachlan, Jr. Utah Engineering Experiment Station, University of Utah, Bulletin 54, Oct. 31, 1951, 67 pages. (TA21 Ut1b)

One of the most convenient mathematical tools in crystal physics is tensor analysis. The understanding of tensors frequently causes some trouble, because of the complexities arising from repeated subscripts, the necessity of making transformations and the difficult concepts such as rank, invariance, etc. Presents a graphical scheme for tabulating the entries in tensors of various rank and indicates a means for computing certain functions after rotation.

Books

4927 The High Pressure Mercury Vapour Discharge. W. Elenbaas. 173 pages. 1951. North-Hollard Publishing Co., Amsterdam. (TK4381 E37h)

Presents a general survey of the above. 138 ref.

4928 Semi-Conducting Materials. H. K. Henisch, editor. 281 pages. 1951. Academic Press, New York. (QC611 H38s)

Presents 25 papers by various authors on the above. Numerous references.

4929 Finite Deformation of an Elastic Solid. Francis D. Murnaghan. 140 pages. 1951. John Wiley & Sons, New York. (QA935 M94f)

Treats, in a self-contained manner, the problem of the deformation of an elastic solid without making the assumption of the classical infinitesimal, or linear, theory of elasticity that the deformation is so small that the squares of the strain components are negligible. Matrices are used methodically, and an account of those properties of matrices which are used in the book is given in the first chapter. Chapter problems.

4930 Helicopter Analysis. Alexander A. Nikolsky. 340 pages. 1951. John Wiley & Sons, New York. (TL716 N58h)

First 4 chapters cover steady-state vertical and forward flight. Remaining chapters treat dynamic stability and control.

4931 Tensor Analysis for Physicists. J. A. Schouten. 275 pages. 1951. Clarendon Press, Oxford, England. (QA433 Sch 68t)

First 5 chapters are concerned with presentation of mathematical theory underlying the use of tensors. Remaining 5 chapters deal with applications of the theory to some physical topics.

See also:
4331 (optical control of acoustic fields)
4368 (light emission of short air sparks)
4394 (fast-neutron spectroscopy)
4488 (nuclear fuel for power production)
4575 (flow in 2-dimensional channels)
4697 (properties of Ag halide crystals)
4953 (principles of semiconductors)
5043 (applications of tensor analysis-book)

33. ELECTRICITY AND ELECTRONICS

4932* Study of the Adsorption of Oxygen on Carbon by Means of Its Thermoelectronic Emission. (In French.) Xavier Duval. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 234, Jan. 7, 1952, p. 208-210.

Thermoelectronic emission of a carbon filament in a highly evacuated tube, through which a stream of oxygen was being passed, was studied.

4933* Experimental Investigation of Oxide Cathodes. (In Russian.) N. D. Morgulis and Ia. P. Zingerman. *Doklady Adademii Nauk SSSR*, new ser., v. 81, Dec. 11, 1951, p. 783-785.

The distribution of the potential in the oxide layer was measured. Data are discussed and charted.

4934 Crystal Comes Back in Electronics. *Business Week*, Feb. 23, 1952, p. 46, 48, 50.

Crystals of Ge are the essential factor in the described transistor, which is tiny, needs little or no electric power, and has a service life of about 10 years—or 2-3 times the life of a vacuum tube.

4935* Compensating for Quiescent Current in Multistage Magnetic Amplifiers. A. S. Fitzgerald. *Electrical Engineering*, v. 71, Mar. 1952, p. 206-211. (To be published in *AIEE Transactions*, v. 71, 1952.)

When magnetic amplifiers are connected in cascade, circuits must be provided to compensate for the effect of quiescent current in one stage on the following stage. Several circuits are discussed, with emphasis on one which combines the best features of each of the others.

4936* Selection of a Carrier Relaying System. R. C. Cheek and J. L. Blackburn. *Electrical Engineering*, v. 71, Mar. 1952, p. 215. (To be published in *AIEE Transactions*, v. 71, 1952.)

Presents a summary of advantages and disadvantages of the 2 basic types of carrier-relaying systems.

4937* The Series Capacitor in Sweden. Gunnar Jancke and K. F. Akerström. *Electrical Engineering*, v. 71, Mar. 1952, p. 222-227.

Swedish engineers have used a series-capacitor installation to increase the transmitting capability of a high-voltage transmission line. Their experiences with this installation and its design are described in detail.

4938* Out-of-Phase Voltage Effects in Circuit Breakers. W. M. Leeds and D. J. Povejsil. *Electrical Engineering*, v. 71, Mar. 1952, p. 275. (To be published in *AIEE Transactions*, v. 71, 1952.)

Comprises an analytic study of dynamic voltages to be expected at the terminals of a tie-line circuit breaker during the separation of 2 parts of a system 180° out-of-phase.

4939* Load-Compensated Variable-Speed Drive for Small Motors. Oscar E. Carlson. *Electrical Manufacturing*, v. 49, Mar. 1952, p. 111-113, 298, 300, 302.

Discusses and describes servo system which holds motor speeds constant at low speeds regardless of load variations. Constant voltage supplied to the armature is compensated for armature voltage drop with change in armature current. Diagrams. 13 ref.

4940 New Industrial Motor Control Circuits. E. F. Kubler. *Electronics*, v. 25, Mar. 1952, p. 110-115.

Explains in some detail the circuit operation of the latest Thymo-trol electronic panel for ¾ to 3-hp. motors operating over both the armature and field ranges, with reversing. 5 control features are provided.

4941 Electron-Tube Curve Generator. M. L. Kuder. *Electronics*, v. 25, Mar. 1952, p. 118-124.

Describes how a family of plate characteristic curves is automatically displayed on a cathode-ray screen together with the locus of the load line and coordinates for direct measurement. Receiving tubes can be analyzed with an accuracy of ±5% using a Land camera. Information is obtained in less than 2 min. Diagrams.

4942 Circuit Stability in Guided Missiles. R. L. Kelly, *Electronics*, v. 25, Mar. 1952, p. 133-135.

Tells how proper circuit design avoids erratic performance by controlling such factors as grid emission, variation in contact potential, heater-cathode leakage, and shock and vibration dangers. End result is a circuit with maximum reliability.

4943 One Microvolt Shows Full Scale. H. C. Thomas and C. W. Hewlett, Jr. *Electronics*, v. 25, Mar. 1952, p. 136-137.

Describes a measurement system which is quite simple in design, easy to use and which has given very reliable service. The system has a full-scale sensitivity of one microvolt, with a precision of ±0.05 microvolt and an input impedance of 50 ohms at 60 cycles.

4944 Ferrite Applications in Electronic Components. B. V. Vonderschmitt, M. J. Obert, and H. B. Stott. *Electronics*, v. 25, Mar. 1952, p. 138-139.

Discusses the characteristics of ferrites such as high maximum permeability, high electrical resistivity and low r.f. losses. Various applications are given.

4945 Klystron Circuits. A. E. Harrison. *Electronics*, v. 25, Mar. 1952, p. 148, 150.

Presents the most-used versions for convenient reference, including 3 regulated power-supply circuits, klystron frequency standards, a.f.c. for reflex klystron local osillators, resonant cavity controls, and phase modulators.

4946 High-Frequency Tubes. 1. Scaling. 2. Laboratory Testing. 3. The Retarding-Field Oscillator in the 2-4 cm. Range. John L. Moll. *Engineering Experiment Station News* (Ohio State University) v. 23, Dec. 1951, p. 12-20, 54.

Discusses the problem of scaling as applied to high-frequency engineering. An oscillator tube of the reflex type is used as an example to illustrate design limitations. Numerous diagrams.

4947 Radio-Frequency Oscillators. 1. A 4-8 Cm. Retarding-Field Oscillator. 2. Theory of Retarding-Field Oscillators. J. James Ebers. *Engineering Experiment Station News* (Ohio State University) v. 23, Dec. 1951, p. 21-31.

Describes circuit types of the above. Numerous diagrams and graphs.

4948 Electron Guns-Point and Line Focus. J. Peck and C. Carter. *Engineering Experiment Station News* (Ohio State University) v. 23, Dec. 1951, p. 32-35, 54.

Discusses requirements to be met in the design of the above. Diagrams.

4949 Low-Field Magnetrons. John L. Moll. *Engineering Experiment Station News* (Ohio State University) v. 23, Dec. 1951, p. 36-44, 54-55.

Presents a study of the operating characteristics of the above. Diagrams and graphs.

4950 Study of Secondary Emission in Retarding-Field Oscillators. Richard Neubauer. *Engineering Experiment Station News* (Ohio State University) v. 23, Dec. 1951, p. 48.

Briefly discusses the above.

4951* Some Considerations Concerning Magnetic Resonance Phenomena in the Radio-Frequency Range. (In French.) A. Kastler. *Experientia*, v. 8, Jan. 15, 1952, p. 1-9.

Guided by analogies and connections between optical spectoscopy and r.f. spectroscopy, the author suggests some experiments on r.f. resonance phenomena. In the 1st part, he shows that, in certain cases, irradiation with light will modify the intensity of radio-frequency resonance signals, and that such an effect is particularly to be expected at low temperature and with circularly polarized light. In the 2nd part, relationships between ultrasonic waves and magnetic resonance are examined and attention is drawn to the fact that magnetic resonance in crystals at very low temperature acts as a generator of ultrasonic waves of high frequency.

4952* Theory and Practice of the Ratio Detector. (In German.) H. Marko. *Frequenz*, v. 6, Jan. 1952, p. 1-10.

Describes the above. Operation and optimum dimensions were determined and experimentally confirmed. Circuit diagrams, graphs, and mathematical analysis.

4953 Germanium Photocells. W. C. Dunlap, Jr. *General Electric Review*, v. 55, Mar. 1952, p. 26-31.

Discusses principles of semiconductors, and optical and photoelectric properties of Ge, with emphasis on the photoconductive Ge phototransistor.

4954 A New Transformer for an Old Application. N. M. Case, and J. P. May. *General Electric Review*, v. 55, Mar. 1952, p. 44-46.

Discusses a fundamentally different type of construction which makes small 3-phase distribution transformers more efficient.

4955* Recent Motor Control Developments for Frequent Starts and Reversals. L. W. Herchenroeder. *Industry and Power*, v. 62, Mar. 1952, p. 71-73.

Discusses interesting features of an adjustable-voltage planer drive, an experimental ignitron contactor control for an induction motor, and a study of the use of d.c. dynamic and capacitor braking for rapidly reversing induction motors and their loads.

4956* Small Paper Dielectric Capacitors. *Industry and Power*, v. 62, Mar. 1952, p. 103-104. (A condensation.)

Discusses the above designed for normal motor, industrial control, filter, luminous-tube transformer, and other a.c. or d.c. applications. Thin kraft paper is used as the solid dielectric, Al foil for the plates, and synthetic fluid for the liquid dielectric in the capacitors discussed.

4957 Thermal and Shot Fluctuations in Electrical Conductors and Vacuum Tubes. Salim S. Solomon. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 109-112.

Presents new derivation of Nyquist's equation, relative to the amount of thermal fluctuations generated in an electrical conductor. Shows that the original equation, as derived by Nyquist, is valid only for physically realizable impedances of the minimum reactance type. This is followed by a new and short derivation of the shot noise formula for temperature-limited diodes.

4958 The Probability Distribution of the Phase of the Resultant Vector Sum of a Constant Vector Plus a Rayleigh Distributed Vector. Kenneth A. Norton, Edna L. Shultz, and Helen Yarbrough. *Journal of Applied Physics*, v. 23, Jan. 1952, p. 137-141.

Formulas, tables, and graphs are given of the cumulative probability distribution of a function frequently occurring in the theory and practice of radio-wave propagation, as well as in the study of the influence of noise in phase-modulation systems.

4959 The Design of Circuits Using Electro-Mechanical Devices. R. A. Brooker. *Journal of Scientific Instruments*, v. 29, Feb. 1952, p. 45-50.

Describes some circuit problems encountered in the design of the auxiliary electro-mechanical equipment used with the Edsac (Electronic Delay Storage Automatic Calculator) at the University Mathematical Laboratory, Cambridge. Diagrams.

4960 Discontinuous Low-Frequency Delay Line With Continuously Variable Delay. J. M. L. Janssen. *Nature*, v. 169, Jan. 26, 1952, p. 148-149.

Suggests a delay circuit which avoids linear and nonlinear distortions from iron-cored inductors and capacitors. Possible applications are given.

4961 Resonant Cavity Measurements on a D.C. Discharge. A. L. Cullen and K. W. H. Foulds. *Nature*, v. 169, Feb. 9, 1952, p. 236-237.

Describes experiments carried out to determine the relative permittivity of an ionized gas in the microwave band. For certain values of discharge current and mercury-pool temperature, the resonance curves are quite asymmetrical. Reasons for this are discussed.

4962* The Wire Capacitor and Other Composite Drawn Products. J. L. Jonker and P. W. Haaijman. *Philips Technical Review*, v. 13, Dec. 1951, p. 145-151.

By means of a special drawing process—the drawing of a tube containing a wire core, with the space in between filled with an insulating material—it was found possible to manufacture capacitors possessing very good properties. Some details of the manufacture, utilizing Cu and Ni, are described. Some applications are discussed.

4963 Secondary Emission from Composite Surfaces. Harold Jacobs, Jack Martin, and Frank Brand. *Physical Review*, ser. 2, v. 85, Feb. 1, 1952, p. 441-447.

A method was utilized for determining the secondary emission threshold energy for various composite surfaces. It was found that each compound had its own threshold energy value below which primaries will not yield true secondaries and above which primary electrons cause the emission of secondary electrons.

4964* The Behaviour of a Series-Transductor Magnetic Amplifier With Directly-Connected or Rectifier-Fed Loads. A. G. Milnes. *Proceedings of Institution of Electrical Engineers*, v. 99, pt. 2, Feb. 1952, p. 13-23.

Examines the above. Account is taken of the finite permeability of the core when considering the circuit sensitivity with self-excitation feedback. Influence of the load on the control-circuit time-constant is discussed. 10 ref.

33. *Electricity and Electronics*

4965* The Production of Current Pulses by Means of a Chopped Discharge. J. Durnford and N. R. McCormick. *Proceedings of Institution of Electrical Engineers*, v. 99, pt. 2, Feb. 1952, p. 33-37.

The method described was used to obtain, in a spark-gap, current pulses of up to 500 amp. in amplitude and 10 miscrosec. in duration with a fall-time of less than 0.25 microsec. The discharge in an RC circuit was modified by inductance to maintain the current in the gap approximately constant for a period of up to about ½ of the unmodified time-constant; the current in the gap is then chopped by a triggered spark-gap, through which the discharge is completed. A nonlinear resistance is used to reduce the fall-time to between ½ and ⅛ of that obtained with linear resistance.

4966* Retarding-Field Oscillators. J. J. Ebers. *Proceedings of the I.R.E.*, v. 40, Feb. 1952, p. 138-145.

Pendulum and velocity-variation types of oscillations in above are discussed. The processes of bunching, drifting, and working of the electrons are explained, and a comparison is made with a reflex-klystron. Recent results are given.

4967* Distortion of a Frequency-Modulated Signal by Small Loss and Phase Variations. *Proceedings of the I.R.E.*, v. 40, Feb. 1952, p. 172-176.

General formulas are developed for harmonic and total distortion in the frequency of the outputs of linear transmission systems with pure frequency-modulated inputs and with amplitude and phase characteristics involving wiggles that can be represented approximately by single sinusoidal functions of small amplitude.

4968* Measurements of Wavelengths and Attenuation in Dielectric Waveguides for Lower Modes. C. W. Horton and C. M. McKinney. *Proceedings of the I.R.E.*, v. 40, Feb. 1952, p. 177-180.

22 references.

4969* The Short-Slot Hybrid Junction. Henry J. Riblet. *Proceedings of the I.R.E.*, v. 40, Feb. 1952, p. 180-184.

Describes a novel, high-performance, x-band hybrid junction. The theory of the device is explained, as well as its particular advantages. The balanced mixer and the balanced duplexer are discussed.

4970* A Statistical Approach to the Measurement of Atmospheric Noise. Robert S. Hoff and Raymond C. Johnson. *Proceedings of the I.R.E.*, v. 40, Feb. 1952, p. 185-187.

A method of measuring and describing atmospheric noise based on statistical considerations is presented, and apparatus for making the measurement is described. Results obtained are compared on a statistical basis with those obtained by methods of noise measurements in common use. Data obtained at low frequencies are discussed.

4971* The Influence of the Core Material on the Thermionic Emission of Oxide Cathodes. H. A. Poehler. *Proceedings of the I.R.E.*, v. 40, Feb. 1952, p. 190-196.

Alloys of Ni with 4.8% Mn, 4.0% Al, 0.38% Mg, and 3.5% W were used as cores, with pure electrolytic Ni as a core being used as a control. The experiments showed that both the d.c. and pulsed emission of oxide cathodes are dependent on the core to a marked degree.

4972 The Emission from Oxide-Coated Cathodes in an Accelerating Field. D. A. Wright and J. Woods. *Proceedings of the Physical Society*, v. 65, sec. B, Feb. 1, 1952, p. 134-148.

Effects of partial space charge on the relationship between field and anode voltage are discussed; and diode characteristics of oxide cathodes are calculated for accelerating fields as a function of the coating parameters. The results are shown to be in agreement with experiment, and to confirm values of coating conductivity, electron density, and mobility determined directly by conductivity and Hall-effect measurements. 12 ref.

4973 Adjustable Speed Characteristics of D.C. Motors. F. A. List. *Product Engineering*, v. 23, Mar. 1952, p. 180-184.

Reviews the performance of the 3 common d.c. motors as their speeds are adjusted.

4974* Subminiature Germanium Photodiodes. Rufus P. Turner. *Radio-Electronics*, v. 23, Mar. 1952, p. 62, 64, 68-69.

Describes the above, giving construction details, operating principles, and applications.

4975 Improved Overload Response of the A-1 Amplifier. F. I. Magee, P. R. Bell, and W. H. Jordan. *Review of Scientific Instruments*, v. 23, Jan. 1952, p. 30-33.

It is frequently desirable to use a linear amplifier to study signals having a wide range of amplitudes. Modifications were made to the A-1 amplifier which permit it to be used with signals up to 300 times the normal overload value. Diagrams.

4976 A Flexible Pulse Amplifier With Good Overload Properties. R. L. Chase and W. A. Higinbotham. *Review of Scientific Instruments*, v. 23, Jan. 1952, p. 34-36.

A general-purpose linear pulse amplifier with good stability, short rise time, and good overloading characteristics is described. The basic circuit consists of two longtailed pairs in a negative feedback loop containing a small amount of positive feedback inside the loop. Diagrams.

4977* Thermal Protection of Oil Cooled Transformers. (In Dutch.) G. M. Van Dijk. *Smit Mededelingen*, v. 6, Oct.-Dec. 1951, p. 112-119.

In oil-cooled, high-voltage transformers, it is impractical and complicated to measure the hot-spot temperature of the winding directly. This temperature can however be ascertained by measuring the temperature of the top oil, using an instrument which is influenced by the heat produced in a resistance by the flow of a current proportional to the load current. Using such an instrument a control and protection system can be obtained based on the permissible hot-spot temperature of the winding. By this system, transformers, working under changing loads and at different ambient temperatures, can be loaded to their permissible thermal limit. Diagrams, graphs, and illustrations.

4978 Performance of Ultrasonic Vitreous Silica Delay Lines. Morton D. Fagen. *Tele-Tech*, v. 11, Mar. 1952, p. 43-45, 138, 140, 142, 144.

Analyzes the electrical performance of an ultrasonic delay line in terms of its equivalent circuit, and shows the relation of insertion loss and bandwidth to the parameters of the piezoelectric transducer, the acoustic medium, and the electrical termination. To assist in the understanding of this treatment, some fundamental considerations of solid delay-line transmission are reviewed.

4979 High Frequency Response of Transformers. M. A. Honnell and H. W. Ragsdale. *Tele-Tech*, v. 11, Mar. 1952, p. 46-47.

Shows that the generally-accepted simplified h.f. equivalent circuit of an a.f. transformer is not of sufficient accuracy for the prediction of the true frequency response of many iron-core transformers above the upper cut-off frequency.

4980 Mechanical Considerations Affecting Vacuum Tube Reliability. Part 2. R. J. Whittier. *Tele-Tech*, v. 11, Mar. 1952, p. 54-56, 102, 104, 106.

Continues the discussion on tubes manufactured for guided-missile equipment. Destructive mechanical tests are described.

4981 Resistors at Radio Frequency; Characteristics of Composition Type. T. J. F. Pavlasek and F. S. Howes. *Wireless Engineer*, v. 29, Feb. 1952, p. 31-36.

The characteristics of JAN-R-11 type, fixed-composition resistors ranging from 1000 ohms to 2 megohms were investigated over the range from 500 kc/s. to 40 Mc/s. The radio-frequency resistance and equivalent shunt capacitance are measured for a group of approximately 45 samples. Curves of equivalent impedance and phase angle are shown. 15 ref.

4982* Decade Multivibrator Design. J. E. Attew. *Wireless World*, v. 58, Mar. 1952, p. 114-116.

Presents a method of stabilizing frequency division from a crystal drive. Includes circuit diagrams.

Books

4983* Energieübertragung mit Gleichstrom hoher Spannung. (Power Transmission With High Voltage Direct Cur-

rent.) Karl Baudisch. 309 pages. 1950. Springer-Verlag, Berlin, Germany. (TK3111 B32e)

Photographs, diagram, graphs, and tables supplement this treatise on the engineering technique and problems of long-distance transmission of electricity. 6-page bibliography.

4984 Short-Wave Radiation Phenomena. Vols. I and II. August Hund. 1382 pages. 1952. McGraw-Hill, New York. (TK6553 H89s)

First section covers the fundamental concepts and relations of currents and electromagnetic fields. The 2nd treats space electromagnetic fields. 3rd section considers fundamental methods applicable to magnetic theory. Many useful formulas connected with wave propagation and its characteristics are presented in section 4. Remaining sections discuss transmission lines and networks; unobstructed space radiation; and space radiation in the presence of electromagnetic obstructions, antenna locations, and electromagnetic diffraction.

4985 Lehrbuch der Drahtlosen Nachrichtentechnik. Vierter Band, Verstarker und Empfanger. (Textbook on Wireless-Communications Technology. Vol. 4. Amplifiers and Receivers.) Ed. 2. M. J. O. Strutt, editor. 422 pages. 1951. Springer-Verlag, Berlin, Germany. (TK5741 St98v2)

Deals with calculation and design of circuits, circuit parts, tubes, high- and low-frequency amplifiers, reduction of spontaneous fluctuation effects, measuring equipment and processes. Diagrams, graphs, photographs, and tables. 371 ref.

See also:
4342 (high-speed electronic recorder)
4348 (method for analyzing servo mechanisms)
4360 (electronic gaging devices)
4400 (Ge in electronics)
4422 (electronic fly-ash recorder)

34. GRAPHIC ARTS

4986* New Data on the Role of Gelatin in Photographic Emulsions. (In Russian.) V. V. Trusov and K. M. Saldadze. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Dec. 11, 1951, p. 867-870.

Experiments were made on the above under various conditions. Data are discussed and charted.

4987* Gold Leafing the Edges of Book Pages. Albert G. Bartolain. *Industrial Finishing*, v. 27, Aug. 1951, p. 54-56, 58, 60.

Tells why edges of book pages are gilded and explains in detail the technique of preparing batches of assembled pages for gold leafing, applying the gold leaf, letting it dry and then burnishing the gold leaf with an agate-tipped tool.

4988* Static Bugaboo of the Pressroom. Eugene St. John. *Inland Printer*, v. 128, Feb. 1952, p. 52-53.

Discusses difficulties encountered through static electricity, and principles involved in coping with the problem.

4989* Balanced Thinners. Mark W. Frishkorn. *Modern Lithography*, v. 20, Feb. 1952, p. 51, 53.

Briefly surveys some of the factors to be considered in the above, as applied in metal lithography. Includes reference to evaporation rate and solvent strength for the particular film-former to be applied.

4990* Lacquer Tested by Foundation Gives Remarkable Results. *National Lithographer*, v. 50, Feb. 1952, p. 26-27, 91. (From LTF Research Progress, No. 25)

Describes results obtained from tests with lacquers for image bases on lithographtic plates. Gives properties, directions for use, and availability.

4991* Linseed vs. Synthetic Lithographic Varnishes. Gregory J. Huelsman. *National Lithographer*, v. 50, Feb. 1952, p. 28-30.

4992 Reproduction of Printed Patterns by Vacuum Evaporation. E. Kafig. *Review of Scientific Instruments*, v. 23, Jan. 1952, p. 54.

Describes a procedure for evaporating Al onto a bonding plastic, "Scotch Weld". The same technique can be applied to any surface which will accept evaporated metals.

See also:
4581 (testing of printing inks)

35. STATISTICS AND ECONOMICS

4993 Northern Michigan Hopes for Better Days. *Business Week*, Mar. 8, 1952, p. 104, 106, 108.

Discusses economic prospects on the basis of new developments in Cu and Fe resources; as well as the lumber industry.

4994 Investment Growth in the Iron and Steel Industry. *Canadian Metals*, v. 15, Feb. 1952, p. 8-9.

A survey of investment, plant expansion, employment, and profits during the period 1926-1950 as shown in the Federal Government's study of investments in Canada.

4995 The Battle for Production. *Chemical Engineering*, v. 59, Feb. 1952, p. 143-149.

An economic survey of chemical production, including separate articles on plants and facilities, processes and technology, mobilization, labor, profit and loss, and supply and demand.

4996 New Plants and Facilities Underway in 1951. A Partial Listing of U. S. Plants and Facilities—in or Related to the Chemical Process Industries—Either Planned, Under Construction, or Completed During 1951. *Chemical Engineering*, v. 59, Feb. 1952, p. 175-185.

4997 Italy: New Life From Resources. *Chemical and Engineering News*, v. 30, Feb. 18, 1952, p. 604-611.

A survey of Italy's industry and resources. Graphical and tabular data cover the chemical industry and industry in general, show petroleum refineries in operation, production of key chemicals, capacities and trends of basic chemicals, principal products of the mining and minerals industry, synthetic-fiber production, and value and distribution of imports and exports.

4998 Solid Basis Underlies Expansion. *Chemical Week*, v. 70, Feb. 23, 1952, p. 21-22, 24, 26, 28.

Deals with expansion in the chemical industry. Includes the impact of war, tentative plans, difficulties encountered through insufficient steel and depletion of low-cost raw material sources. Charted data show the value of output of chemical-process industries, 1899-1952; production of selected inorganic chemicals and gases; 1953-55 investment plans; and sources of investment funds.

4999 Metals In Review. M. A. Kriz. *Engineering and Mining Journal*, v. 153, Feb. 1952, p. 74-102.

Consists of the following articles surveying economic developments and trends of the past year: "Gold," M. A. Kriz; "Silver," Dickson H. Leavens; "Copper," H. H. Wanders; "Lead," Robert L. Ziegfeld; "Zinc," Charles R. Ince; "Tin," H. H. Wanders; "Aluminum," O. C. Schmedeman; "Magnesium," J. D. Hanawalt; "Uranium," Alvin W. Knoerr; "Minor Metals," Charles White Merill; "Antimony," Abbott Renick; "Arsenic," Abbott Renick; "Beryllium," Stanley Needleman; "Bismuth," Abbott Renick; "Cadmium," Robert L. Mentch; "Mercury," Helena M. Meyer; "Platinum-Group Metals," James E. Bell; "Titanium," Frank J. Cservenyak; "Ferro-Alloy Metals," Robert H. Ridgway; "Chromite," Norwood B. Melcher and John Hozik; "Cobalt," Hubert W. Davis; "Nickel," Hubert W. Davis; "Tungsten," Robert W. Geehan; "Manganese," Norwood B. Melcher and E. J. Gealy; and "Molybdemum," Robert W. Geehan.

5000 Non-Metallics. *Engineering and Mining Journal*, v. 153, Feb. 1952, p. 103-113.

Consists of the following articles surveying economic developments and trends of the past year: "Phosphate" H. F. Dengler; "Potash," G. T. Harley; "Asbestos," Walter A. Rukeyser; "Sulphur," Langbourne M. Williams, Jr.; "Fluorspar," Hubert W. Davis; "Perlite", S. W. Johnson; "Barite," R. Rowand; and "Feldspar," Brooke L. Gunsallus.

5001 Dollar-Sign Engineering. L. D. Miles. *General Electric Review*, v. 55, Mar. 1952, p. 58-59.

Four years ago General Electric's Purchasing Dept. undertook

35. *Statistics and Economics*

a new project on the basic value of every part, every item, of a piece of apparatus. Some of the questions raised were: What does the item do? How important is it in relation to the other parts? Can we eliminate it or simplify it? Can we replace it with a standard? Can it be combined with another part? Can it be made from some other material at a lower cost—and better value? Results have been impressive not only in dollar savings but in better products. Outlines 10 tests of values which are applied. Includes 3 case histories in parts fabrication.

5002* The Iron and Steel Industry in India. John E. Brush. *Geographical Review*, v. 42, Jan. 1952, p. 37-55.

An extensive economic survey of the above. 48 ref.

5003 "U. S. International"—A Study of How and Why American Industry Has Invested $16 Billion in Plants Abroad. W. H. Diamond. *International Markets*, Dec. 1951, p. 12-14, 42.

Gives advantages and disadvantages of foreign investments. Presents quantitative statistical data on growth, location, and industries represented. States that high taxes and a deteriorated dollar are the principal reasons for the current trend, and also investments are the only substitute in sight to replace Marshall Plan Aid.

5004* Our Unproduced Reserves; What Are They? Morris Muskat. *Journal of the Institute of Petroleum*, v. 37, Dec. 1951, p. 717-728; disc. 728-736.

An economic analysis of oil reserves in the U. S. Discusses problems involved, solutions, and new developments on the horizon.

5005 India's Iron and Steel Industry. *Journal of Metals*, v. 4, Mar. 1952, p. 252.

The present status and expected future developments of India's iron and steel industry are summarized.

5006* Coal in the Economic Structure of Our Country. Charles Dorrance. *Mining Congress Journal*, v. 38, Feb. 1952, p. 55-57.

5007* Phosphate. James A. Barr. *Mining Congress Journal*, v. 38, Feb. 1952, p. 102-103.

Discusses economic situation and trends of the above.

5008* The Domestic Manganese Picture. Arthur Linforth. *Mining Congress Journal*, v. 38, Feb. 1952, p. 104-106.

5009* Uranium; Exploration Discloses New Deposits in Hitherto Unsuspected Host Rocks as Mining Activity Increases. *Mining Congress Journal*, v. 38, Feb. 1952, p. 128-130.

5010* Industrial Minerals. Joseph L. Gillson. *Mining Congress Journal*, v. 38, Feb. 1952, p. 134-137, 146.

Reviews activity and developments in the above field.

5011* Lignite—A Word to Reckon With. Thomas Edwin Smith. *New Mexico Miner*, v. 14, Jan. 1952, p. 8, 14.

Discusses lignite, its development, and resources. (To be continued)

5012* A Survey of Sulphur Resources. D. H. O. John. *Photographic Journal*, v. 91 B, Nov.-Dec. 1951, p. 118-121.

Presents data on production and consumption of sulfur in America and Great Britain.

5013 Power Presents Its 1952 Modern Plant Survey. *Power*, v. 96, Mar. 1952, p. 79-102.

Presents summaries of design trends and technical details of over 500 central-station and industrial steam units, 125 hydro projects.

5014* The Current World Lead Situation. Future Trends Dependent on International Political Developments. R. L. Wilcox. *South African Mining and Engineering Journal*, v. 62, Aug. 18, 1952, p. 1037, 1039, 1041.

Reviews the overall production and consumption of Pb in 1950, as a means of better appraising and evaluating the current and likely immediate future situation.

Books

5015* The Wealth of India. Raw Materials. Vol II Part 1. B. N. Sastri, editor. 427 pages. 1950. Government of India Press, New Delhi. (HC431 W37)

Presents detailed information on indigenous plants and natural resources of India, whose names begin with the letter "C". Numerous illustrations. Also includes tabular and graphical data on production, imports, exports, etc.

5016* The Wealth of India. Industrial Products. Vol. II. Part II. B. N. Sastri, editor. 251 pages. 1951. Government of Press, New Delhi. (HC431 W37)

Presents detailed information relating to industrial products of India, whose names begin with the letter "C". Includes both technical and economic information. Numerous illustrations and tables.

5017 Limestones of Eastern Ohio. Raymond E. Lamborn. 377 pages. 1951. Division of Geological Survey, Dept. of Natural Resources, State of Ohio, Columbus. (Series 4, Bulletin 49)

Presents, county by county, a brief picture of the stratigraphic sequence, the character, thickness, and distribution of the limestone formations involved, and a detailed study of their compositions.

5018 Air Transportation Management; Its Practices and Policies. Joseph L. Nicholson. 446 pages. 1951. John Wiley & Sons, New York. (TL726.2 N52a)

Presents an appraisal of the above.

See also:
3821 (operation statistics on blast furnaces)
4729 (the future of plastics)
4741 (world production of plastic materials)

36. MISCELLANEOUS

5019 U. S. Bets Its Defense Shirt on Jet Engine Power. *Business Week*, Mar. 8, 1952, p. 58-60, 62.

Discusses the defense situation and states that the Navy and Air Force are both committed to making every combat plane a jet as soon as possible.

5020* Automatic Counting Machine for Paper Currency. H. M. Joseph and C. Stansbury. *Electrical Manufacturing*, v. 49, Mar. 1952, p. 100-105, 288, 290, 292, 294.

The electromechanical machine described utilizes an air jet to separate each note of a packet of currency as it is flipped past a phototube associated with a binary counter which directs the packet either to a "Correct" or "Reject" chute. Rotary solenoids are employed for several functions such as loading, locking, and positioning the packets. Numerous diagrams.

5021* Research—A Major Resource. Clyde Williams. *Land*, v. 10, Winter 1951-52, p. 427-430.

Discusses progress, development, and potentialities of research in America. Proposes a comprehensive program of reasearch to solve the significant problems facing agriculture.

5022 Copper and Copper Alloys; A Survey of Technical Progress During 1951. E. Voce. *Metallurgia*, v. 44, Dec. 1951, p. 303-308.

Discusses the principal items of interest concerning raw material resources, extraction, fabrication, finishing and properties. 85 ref. (To be continued.)

5023 Aluminium and Its Alloys in 1951; Some Aspects of Research and Technical Progress Reported. E. Elliott. *Metallurgia*, v. 45, Feb. 1952, p. 75-80.

Attention is drawn to published work reporting research and technical progress in the various aspects of the metallurgy of aluminium and its alloys, including extraction, founding, fabrication, constitution and properties. 75 ref.

5024* Electrical Equipment in Steel Mills. W. B. Ferguson, *Midwest Engineer*, v. 4, pt. 1, Jan. 1952, p. 3-4, 20-23, 25.

Presents an extensive review on the above. Includes Bessemer requirements, rolling mills, cold strip mills and motor problems.

5025 An Investigation of Boron and Other Low-Alloy Steels. Part I. H. B. Knowlton. *Steel Processing*, v. 38, Feb. 1952, p. 72-75.

Reviews briefly the present status of boron and other alloy steels, and discusses the basis upon which these steels have been selected, tested, and used. Data on chemical composition and mechanical properties are given. Tables. (To be continued.)

Miscellaneous Publications

5026 Fifteenth Technical Conference on Petroleum Production. Mineral Industries Experiment Station, Pennsylvania State College, Bulletin No. 59, 138 pages. (TN21 P38b)

A series of papers by various authors, presented Oct. 24-26, 1951, dealing with research carried on in various fields of petroleum production, i.e., water flooding, wetting agents, core analysis, properties of oil-bearing strata, etc.

5027 Recommendations of the International Commission on Radiological Protection and of the International Commission on Radiological Units. National Bureau of Standards, Handbook 47, June 29, 1951, 29 pages. (T21 Un3h)

Books

5028 Profile of Science. Ritchie Calder. 326 pages. 1951. George Allen and Unwin, London, England. (Q125 C12p)

Presents a history of modern science, written for the layman, with emphasis on personalities involved. The 4 sections deal, respectively, with the Atom; Radar; Pencillin; and Vitamins.

5029* The Meteorological Glossary. Ed. 3. 253 pages. 1951. Chemical Publishing Co., New York. (QC854 G79m3)

5030 The Molds and Man; An Introduction to the Fungi. Clyde M. Christensen. 244 pages. 1951. University of Minnesota Press, Minneapolis. (QK601 C46m)

Discusses the basic facts about fungi; how they live and reproduce and how they affect other plants and animals. Illustrations.

5031* Structural Geology of North America. A. J. Eardley. 624 pages. 1951. Harper & Bros., New York. (QE41 Ea71s)

Describes the structural evolution of the North American continent in post-Proterozoic time. The chapters concern formation and constitution of the mountain systems, basins, arches, and volcanic archipelagos; beveling of the highlands; and filling of the basins. In short, they treat of the procession of deformational and sedimentary events. Numerous maps. 20-page bibliography.

5032* Baughman's Aviation Dictionary and Reference Guide. Ed. 3. Ernest J. Gentle and Charles Edward Chapel. 653 pages. 1951. Aero Publishers, Los Angeles, Calif. (TL509 B32a3)

Augments basic information included in the previous editions by adding up-to-date information on atomic energy, electronics, guided missiles, helicopters, jet aircraft, meteorology, ordnance, radar, rockets, television, and other subjects intimately related to aviation.

5033* Machine and Tool Blue Book. 1952 Directory. 450 pages. 1951. Hitchcock Publishing Co., Wheaton, Ill. (Directory Shelf).

Presents data on sources of supply for the metalworking industry.

5034 Airports: Design, Construction, and Management. Horace K. Glidden, Hervey F. Law, and John E. Cowles. 583 pages. 1946. McGraw-Hill, New York. (TL725 G49a)

Comprehensive treatment of the above. Numerous charts, graphs, and diagrams.

5035* Technical Libraries; Their Organization and Management. Lucille Jackson, editor. 202 pages. 1951. Special Libraries Assn., New York. (Z675T3 Sp31t)

Presents a description of the function of special libraries in the subject fields of the sciences and related technologies. Main activities of such libraries are discussed in logical sequence from the first stages of organization through all of the more important operations.

5036 Geologic Guidebook of the San Francisco Bay Counties; History, Landscape, Geology, Fossils, Minerals, Industry, and Routes to Travel. Olaf P. Jenkins, editor. 392 pages. Dec. 1951. Department of Natural Resources, Division of Mines, State of Calif., San Francisco. (Bulletin 154.) (TN21 C126)

The above contains a sectional geologic map, a series of geologic travel logs, and a large number of separate articles which cover a broad scope of subjects—history, science, and natural resources—all written by authorities in their subjects. Illustrated with photographs, tables, charts, and maps.

5037 Proceedings of First Conference on Coastal Engineering. J. W. Johnson, editor. 334 pages. 1951. Council on Wave Research, Engineering Foundation, University of California ,Berkeley, Calif. (TC205 J63p)

Presents 35 chapters by various authors reporting on specific phases of coastal engineering as now practiced. Main sections are: Basic Principles of Wave Motion; Basic Design Data; Coastal Sediment Problems; Site Criteria and the Design and Construction of Coastal Works; and Case Histories of Coastal Projects.

5038 Operational Research; Its Application to Peace-Time Industry. 151 pages. 1949-1950. Manchester Joint Research Council, Manchester, England. (T58 M31o)

Discusses means by which an understanding of scientific facts can best be conveyed to the world of industry. Includes preface, introduction, papers by 5 research directors, and open forum, and a brief bibliography.

5039* The Merck Manual of Diagnosis and Therapy. Ed. 8. 1592 pages. 1950. Merck & Co., Rahway, N. J. (RC55 M53m8)

The above is intended to supply the physician with accurate, condensed and readily available medical information. Emphasis is on diagnosis and treatment.

5040 Introduction to Number Theory. Trygve Nagell. 309 pages. 1951. John Wiley & Sons, New York. (QA241 N13i)

Presents the most important results and methods in the elementary theory of numbers, including some which have never been treated previously. Includes 180 problems.

5041* Irish Engineering Directory and Buyer's Guide. 196 pages. 1951. Parkside Press, Dublin, Ireland. (Directory Shelf)

Includes "Who's Who" of engineers in Ireland. Buyer's guide gives data on products and services.

5042 Scientific Russian; A Textbook for Classes and Self-Study. James W. Perry. 816 pages. 1950. Interscience Publishers, New York. (PG2640 P42s)

Presents 40 lessons on the above, each lesson concerned with some important facet of the Russian language. Designed for classroom instruction, for self-study, and for reference. Reading exercises form coherent discussions of specific scientific topics. An appendix lists abbreviations commonly encountered in reading Russian scientific and technical material.

5043 Tensor Analysis; Theory and Applications. I. S. Sokolnikoff. 335 pages. 1951. John Wiley & Sons, New York. (QA433 So39t)

First part develops theory without specific reference to any field of application. Second part applies the developed theory to geometry, mechanics, relativity, elasticity, and fluid dynamics.

5044 Introductory Soil Mechanics and Foundations. George B. Sowers and George F. Sowers. 284 pages. 1951. MacMillan Co., New York (TA710 So93i)

The above was written for undergraduate civil and architectural engineering students who are not soils specialists and also for practicing engineers who encounter soil problems in their everyday work. It stresses the rational, scientific approach to soil and foundation problems and explains how the theories are applicable in situations that engineers are likely to encounter in practice. Chapter references.

5045 Outline of Fundamental Pharmacology. David Field-Marsh. 219 pages. 1951. Charles C. Thomas, Springfield, Ill. (RS187 M35o)

Major problems of pharmacology are stated, postulated solu-

36. *Miscellaneous*

tions are explained, methods of solution are pointed out, and references for extended study are given.

5046 The Conservation of Ground Water; a Survey of the Present Ground-Water Situation in the United States. Harold E. Thomas. 327 pages. 1951. McGraw-Hill, New York. GB1015 T36c)

Reviews basic hydrologic principles and data, and provides in outline an inventory of our total water resources. Discusses in detail the experiences of over 70 areas in ground-water development. 21-page bibliography.

5047 Gemeinfassliche Darstellung des Eisenhüttenwesens. (Comprehensive Treatise on Ferrous Metallurgy.) Ed. 15, 258 pages. 1949. Verlag Stahleisen, M.B.H., Düsseldorf, Germany. (TN705 V58g15)

Deals with the beneficiation of iron ore, coking of coal, refractory materials, smelting, innovations in iron and steel production, and modern metallurgical furnaces and other equipment. Includes a survey of iron and steel production in principal countries of the world. Numerous tables, charts, diagrams, and illustrations.

See also:
3897 (alcoa Al alloys-book)
4667 (estimation of toxicity of chemicals)
5016 (industrial production in India)

Notes From Battelle

BIOASSAY FOR COPPER

Studies at Battelle on the role of copper in plant nutrition gave rise to the need for an accurate method of analysis for minute amounts of available copper in soils. This led to the adoption of a bioassay method previously used by Mulder, Acock, and Nicholas, and its development as a routine, analytical procedure. The method is based on the requirement of the fungus *Aspergillus niger* for copper to form pigment and is described in the February, 1952, issue of *Soil Science*.

By the *Aspergillus niger* method, soils can be assayed directly without extraction or measures to eliminate interfering ions. Most important, on soils low in copper, it gives a more accurate estimation of availability than do chemical or spectrographic analyses. The published paper gives recommended laboratory procedures based on experiences at Battelle.

BULLETIN FOR PRINTERS

The Research and Engineering Council of the Graphic Arts Industry, in cooperation with Battelle, has published a bulletin entitled *Static Electricity in Paper Handling*. It is an authoritative study of the causes, behavior, detection, and removal of static electricity in paper during printing. Written in the language of the trade, it is a practical manual to prevent waste and lost production. Copies of the bulletin may be purchased from the Research and Engineering Council of the Graphic Arts Industry, 719 Fifteenth Street, N.W., Washington 5, D.C.

FACTORS IN MACHINABILITY OF METALS

"From a practical standpoint, almost all improvements in machinability of metals have been based on improving their frictional characteristics. In addition to the postulated effects in tool life, friction is undesirable as far as surface finish and energy consumption are concerned." This is the opinion expressed by Francis W. Boulger of Battelle in an article, "Machinability of Metals," that appeared in the February, 1952, issue of *Canadian Metals*.

He points out that most of the work expended in metal cutting is used in deforming the metal in the chips. The energy required depends upon the shear strength of the metal and the strain suffered by the chips. Research has shown that work done per unit volume of metal removed decreases with increases in the feed. This is true because the friction coefficient and amount of chip deformation decreases as the feed is increased.

Frictional characteristics of metals also affect the life of the tool. The rubbing action of both the chips and the work piece controls the temperature of the tool and therefore its life. Research seems to indicate that less heat is absorbed by the tool from chip deformation than is generated at the point of contact with the work piece. Some of this friction may be reduced by employing tools with highly polished surfaces.

COPPER AND LEAD ANALYSIS

Improvements in techniques for analysis for copper and lead are of particular significance in these days of defense demands. This fact makes the publication of a *Working Manual: Electro-Analysis Apparatus* by the Eberbach Corporation especially timely.

The *Manual* outlines methods for the analysis of copper and lead. It presents directions for the setting up and care of apparatus. The *Manual* also includes an introduction to methods, a discussion of general conditions for plating copper and lead, consideration of interference in the determination of copper and lead, and a description of a method of analysis. The descriptions of the procedures as well as the bibliography are a Battelle product. The *Manual* may be obtained from the Eberbach Corporation, Ann Arbor, Michigan.

TIPPING NYLON BRUSHES

China is the primary source of natural bristle for quality paint brushes. The successful development of an acceptable synthetic paint brush bristle, therefore, is of economic and industrial importance. Natural hog bristle is considered a critical defense material and its use is rigidly controlled in brush manufacture.

Professional painters are now using nylon paint brushes to advantage, and the demand for them is increasing, writes brush manufacturer I. A. Rubin in the *Railway Purchases and Stores Magazine*. He attributes acceptance of nylon brushes to three factors: (1) the overcoming of prejudice, (2) improvements in the filaments, and (3) the tipping process by which the ends of the bristles are pointed.

He continues: "I believe that the greatest recent

improvement made is the grinding or tipping process recommended by Battelle Memorial Institute after long research. With this operation, nylon filament is made to simulate natural hog bristle very closely."

MANNA FROM HEAVEN

One man's poison is another man's meat, and urban smoke and industrial flue gases are no exception. To many farmers, the sulfur brought down upon their land by the rains is beneficial. As many as 100 pounds per acre of sulfur a year are deposited on crop lands near urban areas as "free fertilizer."

In a study of the place of sulfur in plant nutrition, Dr. Frank Gilbert, of Battelle, has concluded that crop lands located where sulfur "precipitation" is less than ten pounds per acre per year are in danger of sulfur shortage.

Such areas exist and there is evidence that these locations could profit from sulfur application.

Recent research has shown that the amount of sulfur needed by plants is greater than formerly believed, although it has long been known that sulfur is necessary to both plant and animal life.

MORE FRUIT FOR HOME GARDENERS

Many a home gardener has discovered that the flowers that bloom in the spring do not necessarily end up as fruit. This is especially true where plum, sweet cherry, and apple trees have been planted in isolation. Dr. Frank Gilbert, botanist at Battelle, explains that these types of fruit trees seldom bear when pollenated with their own pollen. Commercial orchards usually plant different varieties in alternate rows to assure cross pollenation.

"This year," Dr. Gilbert says, "we are spraying hormones on isolated plum, sweet cherry, and apple trees in our experimental orchard to test their efficiency for the home gardener." He explains that large greenhouses use hormone sprays on tomatoes to get heavier sets of fruits. This experience led to successful experiments with the use of synthetic hormones on fruit trees. These hormones usually contain alpha naphthalene acetic or indol butyric acids and are commercially available.

BORING ON LATHES TO 0.00005 INCH

Much of the machine work currently being done on materials for defense calls for closer tolerances than is usual for civilian production. R. W. Dayton and C. M. Allen of Battelle have worked out a method of boring with lathes that will give tolerances to 0.00005 of an inch.

The basic idea of the boring technique, first described three years ago, is the employment of a boring bar that works independently of the lathe. The bar is housed in its own jig which can be fastened to the carriage of the lathe. The boring bar turns on two pairs of supporting points which allows the cutting tool to describe an accurate helix. The lathe turns the bar by means of a pair of universal joints. By this method, the accuracy of the cylinder depends almost entirely upon the accuracy of the boring bar.

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The real problem in the years ahead is one of making the most efficient use of all our national resources—and not the least of these resources is our intelligent youth.—*George A. Sloan.*

RECENT PAPERS BY THE RESEARCH STAFF*

Ferrite-Grain-Size Measurements for Ship Plate Steel, J. E. Campbell, R. H. Frazier, and H. O. McIntire. *Welding Journal*, February, 1952.

The Independent Research Institutes—Their Future, F. C. Croxton. *Isotopics*, March, 1952.

Fatigue Strengths of Aircraft Materials. Axial-Load Fatigue Tests on Notched Sheet Specimens of 24S-T3 and 75S-T6 Aluminum Alloys and of SAE 4130 Steel With Stress-Concentration Factor of 1.5, H. J. Grover, W. S. Hyler, and L. R. Jackson. *NACA Technical Note 2639*, February, 1952.

Operations Research, Earl Lamm. *Machine Design*, March, 1952.

Creep in Metals, A. D. Schwope, F. R. Shober, and L. R. Jackson. *NACA Technical Note 2618*, February, 1952.

The Elevated-Temperature Properties of Stainless Steel, Ward Simmons and H. C. Cross. *Special Technical Publication No. 124*, the *American Society for Testing Materials.*

A Spectrophotometric Study of the Oxidation of Tantalum, J. T. Waber, G. E. Sturdy, E. M. Wise, and C. R. Tipton, *Journal of the Electrochemical Society*, March, 1952.

**In most cases reprints will be available upon request to the Editor of the* BATTELLE TECHNICAL REVIEW